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Perceived Competence of Aging Pilots

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PERCEIVED COMPETENCE OF AGING PILOTS

By

Laura M. Stelmach

A Thesis Submitted to the
Department of Human Factors and Systems
in Partial Fulfillment of the Requirements for the Degree of
Master of Science in Human Factors & Systems

Embry-Riddle Aeronautical University
Daytona Beach, FL
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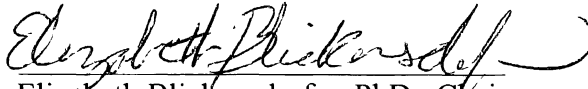
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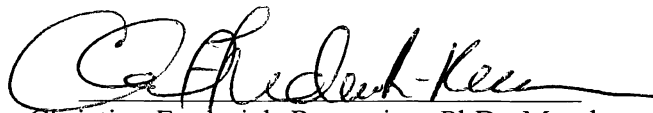
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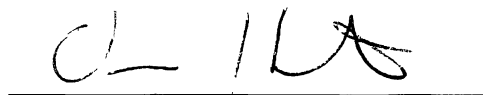
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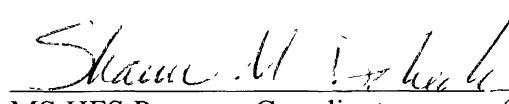
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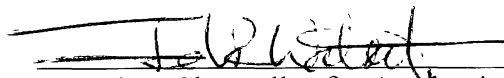

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Abstract

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This study investigated the relationship between age and the perception of competence of pilots by the traveling public. Scenarios were utilized that depicted an airline captain successfully landing an airplane amidst adverse conditions. Scenarios varied only by the age of the Captain: Young, Old, or Unspecified Age and that the Young and Old scenarios included a photo of the captain. Perceived effectiveness, competence, avoidance, blame, and attribution as depicted by the Captain's performance in the scenario were assessed by 180 participants in three age groups (18-34, 35-55, and 56 \leq). Results showed that pilot age is a factor in perceived competence of pilots as well as participant age.

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Introduction

The United States demographic make-up has been changing in the last few generations. The elderly population, defined as 65 and older, is growing. The United States Census Bureau reported in a study that, between 1900 and 1994, the elderly population increased 11-fold where as the non-elderly population only increased 3-fold (1996). Better health care and living conditions allow people to live longer. This fact, coupled with the birth rates being down, increases the average age of the U.S. citizen from 20 years of age at the beginning of the century, to 37 years at its close (U.S. Census Bureau, 1996). As the Baby Boomer generation approaches the elderly category, there is more concern than ever about accommodating the U.S.'s aging population. In 1994 about 1 in 8 Americans were elderly and it has been projected that by the year 2030, 1 in 5 could be elderly (U.S. Census Bureau, 1996). This has created a need for scientific research on aging as we try to cope with the strain that specialized care and programs for the elderly would require. This is especially true for the human factors and ergonomics industry, since the consideration of the elderly in the workforce, specifically skilled labor, and daily life becomes more important with their increased numbers and involvement in the community.

Just as the plethora of healthy older individuals is changing our demographic make-up, they are also challenging our social beliefs of the elderly in the workforce. There have been, and still are, stereotypes and misinformed beliefs about aging that bias perceptions of performance and the productivity of the older worker. These perceptions have led to social upheavals in the workplace with the onslaught of non-hiring practices,

mandatory retirement and its abolition (Levine, 1988). There have been numerous studies in aviation showing that there is a great deal of variability concerning age and performance and that age alone is a poor indicator of productivity (Waldmand & Avolio, 1986; Levine, 1988; Morrow & Leirer, 1997; Tsang 1992; Lassiter et al., 1997; and Blair, 2000). There are still, however, limited mandatory retirement practices. For instance, the FAA 's controversial "Age 60 Rule" argues that certain physiological and psychological functions deteriorate with age, and that it is not possible to predict accurately whether an individual might suddenly become incapacitated (U.S. General Accounting Office, 1989). Therefore, when pilots reach age 60 they are no longer allowed to pilot an aircraft for commercial purposes. There have been several committees set to study this issue. However currently, there has not been a resolution. Research into this area is needed in order to establish if there is an appropriate chronological cut off age or a system of proficiency-based criteria or functional age to judge by. Many still believe, however, that the law retiring commercial pilots at age 60 is a form of age discrimination brought about by bias and stereotypes towards the elderly, especially since the law was enacted without any empirical studies ever being done (United States General Accounting Office, 1989).

It is general knowledge that performance decreases as a person ages. Yet many people remain competent at their jobs, as they get older (Morrow & Leirer, 1997). It is obvious that age is one of many factors affecting performance. This is especially true in highly skilled, domain specific jobs such as piloting an aircraft. The real issue, is the degree to which society as a whole perceives older pilots as being less competent than their younger counterparts regardless of data to the contrary. In examining this issue, it is important to examine age differences pertaining to biological, cognitive and social

constructs and how these factors relate to perceptions and beliefs of competence in aging pilots held by the populous.

Theories of Cognitive Aging

There is more to aging than the obvious physical limitations such as vision, hearing, and manual dexterity. Aging involves changes in the nervous system as well as behavioral changes. Many scientists have postulated several theories that attempt to explain these changes. One thing that seems to stand out about these theories however is that there are gaps in them. It can be seen, for instance, that scientists have focused on describing what happens in cognitive aging rather than explaining the mechanics of it and how these causal factors pertain to their theories. This focus is understandable considering that our understanding of the human brain is still incomplete. Neurocognition is defined as “the study of the relationship between neuroscience and cognitive psychology, especially those theories of the mind dealing with memory, sensation and perception, problem solving, language processing, motor functions, and cognition (Solso, 1998, p. 38)”. This new science may pave the way for scientists, linking physical evidence and their theoretical structures of the mind. Until then, an understanding of such theories as cognitive slowing, resource reduction, crystallized and fluid intelligence, and failure to inhibit, are essential in understanding the constructs of cognitive aging.

Cognitive Slowing

The theory of cognitive slowing involves a gradual reduction in the rate of processing information. This affects both sensory motor and cognitive processing (Morrow & Leirer, 1997). In an article done on aging and pilot performance Tsang (1992) discusses three possible reasons for this reduction. One reason states that at each step of information processing, there is an increased rate of information loss. Due to the reduced amount of information available, slowing is assumed to have occurred. Another possibility is that processing rate slows as we age. As the environment changes, information is only useful for a short time. This reduced time availability may be accountable for performance decrements since an older person may not be able to process the information in a manner that makes it useful until after its usefulness lapses due to changing circumstances. Finally there is the possibility that due to age related neurophysiological changes, neural transmission rates are reduced and random neural firing increases the signal to noise ratio. This means that identifying useful bits of information is more difficult and takes more time. This may result in slower reaction times to stimuli and more time and resources needed in making decisions. Either way slowing could result in older adults requiring more time to add new skills or behaviors (Park, 1992). This theory does not get into why these changes happen and there is disagreement as to the irreversibility of slowing. For example, Willis & Schaie (1986) believe that slowing may reflect biological change and experiential factors that may be reversed by training and proper health. Such training has shown that older as well as younger workers benefit (Sparrow & Davies, 1988).

Resource Reduction

A second theory to account for cognitive decline is resource reduction. Resource reduction is a decline in cognitive resources available for the storage and processing of information, generally seen as people age (Morrow & Leirer 1997). Cognitive resources such as memory, attention, and psychomotor skills are tested utilizing multi-tasking and divided attention methods. Reasoning for this is that if there is a limited amount of resources, dividing these resources into tasks that require simultaneous processing should cause age-related performance decrements (Tsang, 1992). It should be noted however that quantifying cognitive resources and relating them to performance is difficult and care should be taken in reviewing studies that have attempted this. Aging effects are slight in studies that use a median age split, requiring large sample sizes. Even so, many divided attention studies have shown that significant age related performance reductions are generally only seen at multi-tasked applications at very high complexity and workload levels, not in single or dual tasks applications (Tsang, 1997,1998; Vincenzi, et al. 1997; Hyland et al 1994; Lassiter et al. 1997). Hence, even if there are reductions in resources as people age, they may be slight enough that individuals remain competent in performance of tasks and may compensate for deficiencies in other ways, such as constant training and maintaining a level of expertise in a task (Salthouse, 1990).

Crystallized vs. Fluid Intelligence

Another area that may lead to cognitive decline as we age is intelligence. Intelligence has been theorized to be a multidisciplinary function in which there are two distinct forms (Horn & Cattell, 1966; Schaie, 1996). These are crystallized and fluid

intelligence. The first is associated with experiential learning and the second is related more to biological influences that occur in development. For instance crystallized intelligence involves processes such as verbal comprehension, mechanical knowledge, experiential evaluation, and ideational and associational fluency. On the other hand fluid intelligence involves processes such as inductive reasoning, figural relations, associative memory, and intellectual speed. There are areas where each form of intelligence overlaps in their broad spectrum, since certain skills such as general reasoning and semantic reactions utilize both forms of intelligence. Both forms of intelligence are theorized to form rapidly throughout childhood, however, fluid intelligence is theorized to stop when neural maturation ceases while crystallized intelligence only drops off when educational effort drops. Hence, as a person ages their fluid intelligence should decline while crystallized intelligence could potentially increase. In Horn and Cattell's (1966) study, they theorized that there should be a fairly even level of overall intelligence as people age, since one form should compensate for decline in the other and total decline should only be seen in rather late stages of development. Their results shows this to be true and gives relevance to other studies done on mitigating measures such as expertise and its impact on cognitive measures such as memory and attention (Tsang 1992,1995,1997; Tsang & Shaner 1998; Morrow et al 1999, Morrow & Leirer 1997; Salthouse 1990; Hultsch & Dixon 1990; Staudinger & Pasupathi, 2000)

Failure To Inhibit

Finally, a failure to inhibit unwanted information may result in declining performance as we age. Unlike the other theories, which are based on declining

resources, this theory is based on the inability of an older individual to inhibit irrelevant information from enter working memory (Park, 1992). Working memory is a part of short-term memory that contains active and current information for further processing (Solso, 1998). This theory states that older adults may not select the most appropriate information, therefore irrelevant information hinders the processing of more relevant information for the task at hand (Park, 1992). This leads to the conclusion that environments rich with information require more selective attention. Selective attention is the ability to filter out extraneous information, such as a person's ability to hear their name being called in a noisy room. Older pilots may be more vulnerable to distractions since more selective attention is needed to counteract the inability to inhibit, thereby slowing down processing required for decisions-making skills (Morrow & Leirer, 1997).

These theories of cognition explaining age related decline as a dual process system in which two opposing forces direct two separate kinds of aging. For instance early development or adolescence is considered growth where as adult aging is seen as decline or deterioration (Perlmutter, 1988). This view of aging may be appropriate for biological aging since it is believed that, biologically, preprogrammed processes that cause deterioration of the cells exist (Shock, 1985). However, according to Perlmutter, this view may be inappropriate for psychological aging since it is seen to be multidirectional and multicausal and there "appears to be no age-based dynamism that moves humans toward psychological death". Instead, some processes are seen to remain stable or increase throughout the lifespan of healthy adults (Horn & Cattell, 1966). Even despite declines in cognition many people maintain their performance levels in their chosen field and experience mitigates the effects of aging.

Cognitive Factors In Piloting

Before discussing aging and cognitive factors in piloting it is best to keep in mind the population that is being discussed. Pilots are required to maintain a standard of performance by frequently undergoing assessments to attest to their skill. They undergo frequent medical examinations and are also required to maintain physical and mental health to keep their jobs. Pilots are constantly learning new skills to keep up with the advancements of technology and frequently required to undergo retraining despite their current performance. Piloting is a domain-specific task that involves developing a certain level of expertise, which has also been shown to mitigate aging effects (Tsang 1992,1995,197; Tsang & Shaner 1998; Morrow et al 1999, Morrow & Leirer 1997; Salthouse 1990; Hultsch & Dixon 1990; Staudinger & Pasupathi, 2000). In light of all these conditions, aging pilots must maintain not only their performance, but also their competence in their chosen field. These circumstances make pilots a vastly different population to study than the average individual.

There are several important points to consider when discussing cognition and the piloting of an aircraft. First and foremost, flying an aircraft involves a dynamic environment. Demands on pilots are constantly changing. For instance, one moment a pilot is cleared as filed on the flight plan and in the next instance the controller will change the route structure to account for congestion. This leads to other changing circumstances such as fuel consumption, time of arrival, and possible weather hazards. The next point is that flying is a multi-tasked environment that requires time-sharing between tasks during high workload situations (Morrow & Leirer, 197). A pilot is rarely

required to do just one task at a time. More often attention must be divided between listening to air traffic control, writing down instructions, watching the instruments, and performing maneuvers. These tasks all affect performance of cognitive functions since there is high workload involved and the job is cognitively demanding. This is even more true since the dawn of automation. Automation has shifted workload from purely physical tasks, such as flying the airplane, to cognitive tasks such as decision-making and information management (Morrow & Leirer, 1997). Cognitive factors that are particularly important in flying are psychomotor skills, attention and memory (Morrow & Leirer, 1997).

Psychomotor Skills

Psychomotor refers to “movement or muscular activity associated with mental processes” (American Heritage Dictionary, 2000). These skills entail both visual and auditory perception in activities. Pilots cue in on visual and auditory information involved in monitoring flight conditions, controlling the aircraft, communicating with air traffic controllers and other tasks involved in the flight environment. However, as we age certain conditions change in vision and audition. While most of these changes can be accommodated, some cannot and may affect flight performance in the form of reaction times.

Several aspects of the visual system change with age. The lens of the eye yellows and becomes thicker. The lens then becomes opaque, resulting in less light making it to the retina and a greater absorption rate for short wavelengths (Sekuler & Blake, 1994). The lens also becomes less flexible and its ability to change focus declines.

Farsightedness is common. The pupils resting diameter also declines and because of this, retinal illumination declines. This causes light to be scattered reducing retinal image contrast (Kline & Scialfa, 1997), and this in turn affects performance on tasks carried out in low levels of illumination. Acuity and depth perception are affected since low retinal illumination is linked to a decline in contrast sensitivity at intermediate and high spatial frequencies (Kline & Scialfa, 1997). Glasses and awareness can accommodate most imperfections in the lens. However changes in pupil diameter and cell deterioration, in this case retinal ganglion cells and the receptors cannot be accommodated. In a cockpit environment that is fraught with low illumination, color-coding, and where the need for acuity, spatial, and depth perception in flight maneuvers are crucial, such decrements could cause declining performance.

It is typical for hearing loss to be more common in the elderly. As we age we lose the ability to discern high frequencies (Sekuler & Blake, 1994). Difficulties in communications take place, since the majority of speech occurs in the high frequency range. This problem is increased due to background noise, which tends to mask low frequencies. Communications in aircraft are often muddled with engine and other background noise. Listening for an aircraft's particular call sign and directions from air traffic control can become increasingly difficult for the individual. For an older pilot, more concentration is needed to catch communications and to sift through irrelevant information (Park, 1992; Morrow & Leirer, 1997). A safety hazard may be created since smooth and relatively risk free flight operations rely on accurate cooperation of both the pilot and controller.

It is interesting to note that age declines in perceptual abilities and aviation accidents have not been correlated (Morrow & Leirer, 1997). Reasoning for this may be that, while these factors affect performance and can be crucial to the flight environment, most pilots who experience serious decrements in their visual and hearing capacity are denied medical certification. Regardless, low illumination and noise pollution considerations should be implemented in aircraft design.

Attention and Workload

Attention is also an important cognitive factor in flying an aircraft. Monitoring the instruments requires a pilot to switch attention constantly from one instrument to another, and at the same time requires sustained attention in monitoring information. Listening for air traffic control information while navigating and controlling the aircraft requires pilots to time-share and multi-task. Also there are times when a pilot must filter out information and select that which is only important to their particular flight. Attention is involved in every aspect of cognition and is crucial to performance.

Time-sharing and multi-tasking are some of the most resource consuming tasks in attention. They are often used to test workload in performance research. The current resource reduction theory suggests that as you age you should have performance deficits. A study done by Tsang (1997) showed that the ability to prioritize and handle dual tasks degraded with age. Another study done by Vincenzi et al. (1997) found that age greatly affected overall performance in monitoring tasks depending on whether the task was single, dual, or multi-tasked. This suggests that as tasks grow in complexity, so does the difficulty in dividing attention resources in older adults when compared to younger

adults. However it was also stated that significant degradation in performance was seen only in complex, high workload, multi-tasking environment not dual or single task environments.

Sustained attention in flying an aircraft is essential for vigilance tasks such as monitoring instruments. This is especially true for fly by wire aircraft. Automation requires a pilot to take a less active role and become a supervisor. According to McDowd and Birren (1990), when people age, their overall performance in tasks requiring sustained attention or vigilance degrades. In extended tasks, however the normal vigilance decrements do not seem to be greater for older adults than for younger adults (McDowd & Birren, 1990, p. 225). Also in dual tasks there have been no significant differences between young and old adults in performance (Tsang, 1992). To explain decrements in detection and accuracy of a signal it has been suggested that the lower arousal and or the greater distractibility in older adults may be the cause.

Distractibility in older adults appears to be a factor in age decrements for selective attention as well. In selective attention a person is required to filter out information from many channels. Older adults are said to have a reduction in inhibitory control over their behavior (Park, 1992). This allows for distracters to catch their attention and as a result they are unable to filter out irrelevant information. Another theory that may contribute to this difficulty is the spatial localization hypothesis by Plude and Hoyer (McDowd & Birren, 1990, p. 227). This theory states that age decrements exist because the ability to locate task relevant information in the visual field declines as people age. Due to this decline, older adults need to utilize more resources than younger adults to process information. This takes more time than younger adults and increases the likelihood of

errors. However in studies concerning experience and attention it has been suggested that experience may help maintain attentional skills among pilots for familiar tasks (Morrow & Leirer, 1997).

Memory

In flying an aircraft there are two main types of memory that are utilized. The first is working memory. Working memory is used to store verbal information and spatial information. This in turn allows the pilot to update and or build a mental model of the activities going on around them. If the aforementioned theories are taken into consideration, then age effects will have a degrading affect on working memory. Not only will there be reduced capacity for short-term storage, but the pilot's ability to retrieve information from long-term declarative memory will also be disrupted, since it is working memory that holds the information for temporary use (Solso, 1998). The second aspect of memory that is important on the flight deck is prospective memory. Prospective memory entails remembering to carry out some future action (Craig & Jennings, 1992) and is analogous to procedural memory in that it deals with remembering flap settings, calling air traffic control at appropriate times, check lists, manuals, and reading displayed information accurately. There are many procedures that are used in the flight environment and there are several accidents that are involved where procedural lapses such as forgetting to set flaps at take-off occur. As we age, our dependence on checklists increase and expertise may in fact come into play due to prior experience in knowing what information is available and on hand.

Age & Expertise

It was found in laboratory testing, that as people age, their performance in many tasks deteriorate (Hyland, Kay, Deimler, & Gruman, 1994; Hyland, Kay, & Deimler, 1994; Lassiter et al., 1997; Morrow & Leirer, 1997; Sparrow & Davies, 1988; Spirduso & MacRae, 1990; Tsang, 1995 & 1997; Tsang & Shaner, 1998, Vincenzi et al., 1997 and Waldmand & Avolio, 1986). However, when looking at the populous as a whole it is seen that many people considered elderly in fact succeed in their chosen field (Morrow & Leirer, 1997; Blair, 2000; Levine, 1988; Restak, 1997; Salthouse, 1990; Perlmutter, 1988). One element that may bridge the gap between laboratory studies and real world observations is expertise. Expertise postulates that due to repetitiveness, practice, and experience involved in domain-specific tasks, age effects are mitigated. Since this explanation was proposed, there have been few studies to understand exactly in what way and in what circumstances expertise diminishes aging effects. There have been some findings however, that expertise does mitigate aging affects in performance.

Domain-Specific Tasks

In her article on aging and pilot performance Tsang quotes Klegl and Baltes' (1992, p. 194) theory that expertise is "developed through long-term preoccupation with domain-specific knowledge and continuous practice of behavioral routines." Domain-specific knowledge "pertains to factual, procedural knowledge, and skills that are achieved through practice, conditioning, and procedural learning and is not limited to declarative facts" (Staudinger & Pasupathi 2000 p. 636). In any domain, expertise is characterized by elaborated knowledge structures that are well developed and allow for

fast and efficient problem definition, reasoning, and decision-making processes in domain-specific problem solving (Staudinger & Pasupathi, 2000). Tsang also points out that this knowledge structure in older adults allows them to readily solve problems, however in younger, less experienced adults knowledge structures have yet to form. Hence, there is no basis of evaluation for inexperienced persons to base a decision on and it may take longer for them to come to a conclusion and reduce accuracy. Even though younger adults are faster in problem solving and decision-making tasks, older adults aren't far behind them and tend to be more accurate due to their prior knowledge. However, even though older adults that are experienced on some task perform competently in high cognitive workloads related to that domain, they may perform no better than same-age novices on other complex tasks (Hultsch & Dixon 1990). This is the limiting factor of domain-specification.

Expertise

There are four main theories as to why expertise mitigates aging effects in cognition. The first is that experience maintains or preserves abilities that would decline in the absence of this experience (Salthouse 1990). This theory concludes that the time, practice, and motivation that it takes to become an expert in a certain skill staves off cognitive decline due to aging. Hence the area of expertise that is maintained won't show great deficits, however other areas will. The second theory deals with accommodation. It states that as people age they accommodate their difficulties by avoiding demanding situations (Morrow & Leirer, 1997). For example, senior pilots are able to choose less demanding routes to fly, thereby combating the added stress of flying longer shifts at

difficult hours. Also senior pilots would be able to take more time off than low seniority pilots. Another theory proposed, is the Compilation Perspective developed by Salthouse (1990). The idea here is that “although the initial development of competence may have been dependent upon efficient functioning of cognitive abilities, continued maintenance of the same level of competence no longer may require the same degree of efficiency in those abilities.” This means that when a person is learning a new skill, it takes more time and cognitive resources to acquire the skill. However, since the skill has been learned already and has been honed through many years of practice, the effort to maintain it is less than it was to learn it initially. Hence, competence in such a skill is easier to maintain as cognitive abilities/performance declines. Finally there is the theory that increased expertise leads to the ability to compensate for age related deficits (Morrow & Leirer, 1997). This concept is that because experts have prior experience and know what to expect, they can schedule more time to do certain tasks that would take additional time for an older adult to do competently. In addition, this prior experience in dealing with and performing duties allows more experienced pilots to devote less time to ordinary tasks than less experienced pilots. This would free up space in working memory and allow them to concentrate on more crucial activities.

Pilot expertise can be measured in many ways. Some studies relate pilots to non-pilots as a measure of expertise. This measure is useful if pilots are to be compared to the general populous, however generalizing among pilots themselves is difficult since the “expertise” variable is generally not quantified among the pilots. Using non-pilots also makes it easier to acquire a better age range of participants for expertise studies since it can be difficult to find older pilots with little flight time. Most studies however, use

hours of flying time as a measure and have dealt with pilots alone, thereby refining their expertise requirements by using total time, recent flight experience, and type of aircraft flown (civil or military etc). It is difficult to get pilots over age 60 that have recent commercial flight experience due to the “Age 60 Rule” brought about by the Federal Aviation Administration in 1969. This rule prohibits people over the age of 60 to fly commercially in most cases and consequently few studies deal with the elderly and concentrate instead on middle-aged subjects. (U.S. General Accounting Office, 1989). This has severely limited age and expertise studies.

Recently, a few studies have been done relating age, expertise and pilot performance. One study in particular done by Morrow et al. (1999) examined the effects of age and expertise on a pilot’s ability to communicate. Pilot and non-pilots listened to air traffic control messages that described a certain route through airspace, while referring to a map of the airspace. Air traffic control messages were in the standard format and mixed in several non-standard formats. The subjects were then asked to read back the instructions and answer questions about the aircraft’s route. Read-back accuracy was better for pilots as compared to non-pilots, as well as for younger participants compared to older participants. Expertise effects were reduced for longer and unorganized messages. This shows that a pilot’s ability to use domain knowledge was hampered when the communication task taxed working memory. Expertise was significant in probe accuracy and only pilots had schemas enabling them to take advantage of message organization. The final result of the study did not find that expertise reduced age differences in the readback accuracy part of the experiment, however it is suggested that this is due to the fact that pilots were not allowed to use aids

such as a pen and paper to facilitate memory, which under normal circumstances they would have done. Such a departure from real world application inhibits an expertise affect, since expertise has been shown to mitigate age affects through accommodation and compensation (Salthouse, 1990).

Expertise is also shown to have a positive effect on workload. A study done by Tsang (1995) studied whether or not time-sharing performance deteriorated with increased age and if expertise mitigated these decrements. The study utilized non-pilots and pilots to compare expertise in instrument-tracking tasks, spatial processing tasks, and short-term memory tasks. Tsang examined group mean differences and response distribution overlap in single task performance, dual task decrements, and optimized scores. The results showed that older subjects time-shared less efficiently than younger subjects. However among older pilots this disparity was lessened. As far as interaction between age and expertise in tracking error, it showed that there was a general increase in decrement with increased age. Tracking error being defined as the amount or decrement of deviation from the proposed flight path. The difference between the old and middle-aged groups tracking error was much larger than that between the middle-aged and young groups. The old non-pilots had disproportionately larger decrements in tracking error as well. This disparity supports the fact that age does affect pilot performance and that expertise does play a role, especially between non-pilots and pilots.

A later study by Tsang (1997) showed that flight experience contributed only modestly to single tasks and time-shared tracking performance. This experiment examined the contribution of age to performance against demographic and flight experience variables. These variables were age, gender, whether or not the subject was

retired, whether the subject was a pilot, years of education, and computer experience. Another set of variables only related to pilots, these were whether they flew professionally, the class of medical carried, if they were instrument rated, total flight hours, and how often they flew. Tsang tested for four visually presented, single tasks of acceleration control tracking, manual response task, and manual and speech response memory tasks. Even though flight experience contributed only modestly to single tasks and time-shared tracking performance, it was stated that the variables of flight experience were intercorrelated with each other and only their combined effects were apparent. It was also stated that the sample size was insufficient to adequately test the full set of variables. The important result in this research is that expertise is shown to contribute to performance.

Tsang and Shaner (1998) found age-related deficits in time-sharing efficiency and resource allocation for people over the age of 60. They tested pilots and non-pilots in three tasks (Tracking task, Planikin task, and Sternberg memory task) that were conducted singularly or dually with emphasis on equal priority or differential priority. Their study of age, attention, expertise and time-sharing found that age related deficits seemed to occur in time-sharing efficiency and resource allocation only when subjects were under intense attentional demands when precise control was required. Even so, their study suggested that both expertise and practice could reduce age-related declines in performance. Also note that even though these studies found deficits, few of them found significance deficits in time-sharing efficiency between the young (usually non-pilot) and the old expert.

It is interesting to note that most of the studies done on aging and expertise deal with general aviation pilots. This may, in fact, underestimate expertise effects. General aviation pilots often do not undertake the same training or currency of training as professional pilots and do not have the same health limitation imposed on them. Other factors that account for variability among studies are how subjects are divided, task factors such as workload, difficulty level, and domain relevance (Morrow & Leirer, 1997; Salthouse, 1990). For instance a study done by Lassiter et al (1997), who studied the effects of aging and expertise on mental workload related to a simulated aviation task, found that there are significant main effects for age, workload, and expertise. Their study utilized secondary task methodology by having the primary task of the pilot flying a predetermined route on a simulator and the secondary task being a memory task, where the subjects had to memorize a set of letters in sequence and then identify that letter as being, or not being, in one of the groupings they had memorized when it was flashed on the screen during their flight. Age was partitioned into three groups (18-30, 31-55, 55 and above), workload depended on the complexity of the flight path flown and the length of memorized letters, and expertise was separated into two groups by a median split in flight hours. The results state that there were a significant interaction effects between expertise and workload, and age and workload. However, a three way interaction between the three variables of expertise, workload, and age interaction, only approached significance. The experimenters suggest that this is due to a median split of flight hours, to partition expertise into two levels. A stronger manipulation and or partitioning of recentness of experience may have provided for a stronger effect. They did find that in going from a

single task to a dual task situation, expertise mitigated the effects of aging. The research suggested strengthening the manipulations to demonstrate this effect.

Through expertise older adults are able to maintain their abilities, accommodate declining abilities, and compensate for areas where their performance has already declined. It is seen through the above experiment's results, that such expertise does mitigate the effects of aging, allowing older adults to perform as well as younger adults. This is one factor that may explain why older adults continuously maintain their competence and succeed in their chosen field.

Another factor to consider is that even though older adults' performance and productivity may decline in certain tasks when compared to younger workers, this decline may not render such performance and productivity unacceptable for a particular job (Levine, 1988). In fact, the capacity required for adequate and competent performance, may be sufficiently below that possessed by older workers (Levine, 1988). For instance, studies that relate workload, and single/dual/multi-tasking ability, seemed to suggest that declines were mainly seen under higher workload and multi-tasked situations, not under single task or moderate workload situations (Tsang & Shaner, 1998; Vincenzi et al, 1997). Also it has been seen that in general, there is only a slight decline in overall performance for older workers in some job positions (Waldmand & Avolio, 1986). However, despite these factors, older workers are generally seen as less competent than younger workers (Bieman-Copeland & Ryan, 2001; Blair, 2000; Kwong See, Wood, & Hoffman, 2001; Hummert, 1994; Palmore, 1990; Rosen & Jerdee, 1977). Because of this perception, it is important to understand the facts of an older person's performance in the workplace as well as the social views attributed to them.

Competence, Aging Individuals, and The Workplace

Competence is defined as the state of being fit or capable (Allee, 1986). That means that when discussing the workplace employers have certain performance criteria and basic qualification that an employee needs to meet in order to be competent in their job. This criterion may change depending on what type of job or task is being performed. Hence, a person may be competent for a particular task and not competent for a particular job or vice versa. Employers utilize criteria that are both subjective and objective. However stereotypes, generalization, and attitudes of society as a whole may bias an employers ability to be objective and may perceive incompetence where there is none. This perceived incompetence might foster even more negative attitudes and biases. Because of these misconceptions, it is important to analyze competence from the angle of performance as well as social perspectives.

As A Matter of Performance

Work habits.

Work habits of older employees tend to be better than younger employees (Levine, 1988). For instance older employees have a lower turnover rate and lower avoidable absenteeism (Czaja, 1990; Panek, 1997; Blair, 2000). Concerning unavoidable absences, the middle-aged group has the fewest absences compared to any other age group (Panek, 1997). They also have a higher tendency to show up for work on time. The reasoning for this may be higher overall job satisfaction and the difficulty of older workers in finding alternative jobs at the high pay rates that they currently enjoy. Older

workers also have a higher sense of loyalty for a particular company. For instance, Savoie (1990) did a case study on Ford Motor Co. during the 1980's recession. Ford Motor Co. was in trouble and decided to downsize employees and made drastic cuts in their workforce. This resulted in an average age of 43 years for individuals in their workforce. Two thirds of employees were 40 years and older with only six percent being under 30 years of age. Ford Motor Co. implemented drastic management changes as well asking employees to give extra effort, learn new tasks, accept new responsibilities, function with less support, and discard comfortable ways of operating in favor of the new changes being made. As a result of workers' dedication, management and workers' willingness to work together, Ford Motor Co. achieved a total turnabout in production and won many awards. Savoie found that Ford's older workers were just as creative as younger workers, were more committed to the company, took more pride in their work, showed more patience with management, and were more forgiving of mistakes. This is a prime example of older workers' competence in the workplace.

Accident rates.

Accident rates in the workplace among the general population show that rates for older adults are lower than rates for younger adults. Specifically, older workers with an age of more than 45 years are injured less frequently than those workers under 25 years of age (Panek, 1997). Panek also reviews a study done by Root in which Root took data from over a million worker compensation records and found that generally the highest accident rates were for workers of 20-24 years of age for most all job types. The lowest were for workers 65 years and older.

Kay et al (1994) did a study correlating accident rates, age and experience among pilots holding Class I, II, & III medical certificates. Note that due to the Age 60 Mandatory Retirement Rule, data for commercial pilots over the age of 60 is not available. Hence, data was restricted to pilots between 30 and 59 years of age. In all three conditions accident rates for the younger pilots decreased with an increase in age, where as the rates for older pilots were lower but leveled off. In examining Class III pilots from age 50 to age 70, there was no relation between age and accident rates. What impacted accident rates the most was recent flight time, with the more recent flight time being correlated with fewer accidents. In summary this study found no support for the theory that scheduled air carriers had increased accident rates as they neared age 60. In aviation, as well as the general population, it seems that accident rates are lower for older adults as compared to younger adults.

Observer ratings and productivity.

The FAA and commercial airlines typically assess pilot performance via observer ratings. Currently there are two major ways pilots are assessed (Hyland et al, 1994). The first assessment is based on instructor judgment and ratings of each task where tasks by themselves are either pass or fail. The second assessment, utilizes a rating scale for instructors to assess performance factors for an overall pass or fail rate. Both methods are still very subjective and result in a pass/fail condition. Even researchers who study competency and safety issues often rely on such observational survey methods. For instance, since commercial pilots are required to undergo performance evaluations every six months along with recurrent training and/or transition training for other aircraft, it

makes sense to survey check airmen as to the competence of those pilots they test to see if age is indeed a factor. A study was conducted by Counts (2000), in which check airmen from US Airways were asked to fill out a questionnaire pertaining to the performance of two age groups, 45-54 and 55-60. The results of this experiment showed that there were no differences in overall performance noted between the age groups. Only two areas showed significant differences between the two groups. The first compared the difference of age and its impact in processing large amounts of information in relation to time. The 45-54 age group scored significantly higher on both questions that pertained to this topic. The other area that showed significant differences was that which asked whether the 45-54 age group had an advantage in problem solving over the 55-60 age group. The results showed that the airmen significantly thought that this was not the case. It is interesting to note that these two areas correspond to the theories of cognitive psychology where processing is reported to slow with age, however decision making ability is mitigated by experience. The impact of this study is lessened by the fact that the age group separation is close together and by the small number of respondents that chose to respond to the questionnaire. Unfortunately, test measures such as these are very subjective and prone to bias, however they still remain the best way for the FAA and airlines to evaluate pilot performance (Hyland et al, 1994).

Supervisory and peer ratings are a common way of measuring performance in many industries besides aviation. However, when these ratings are compared to productivity ratings, there are wide variations in their results. Waldman and Avolio (1986) did a meta-analysis of such performance measures and found that age and performance were negatively correlated, showing a mean correlation of $-.14$ for

supervisory ratings. Peer ratings, however, showed a slight increase with a correlation mean of .10 and productivity ratings showed an even greater positive trend with a mean of .27. In this case productivity is defined as the unit output over a period of time, which could be the number of units produced or patents and publications achieved. Overall studies of productivity and age show a positive trend whereas observer ratings show a negative trend. Reasoning behind this could be that productivity may be a fairer evaluation of performance since it is more objective and observer ratings may be affected by personal bias. A discussion of current social perceptions and possible biases follows.

As A Matter of Perception

Perception of performance by an individual may be colored by person's beliefs, attitudes, and generalizations developed as they accept the facts as well as the myths and stereotypes of society. These attitudes and stereotypes contain both negative and positive connotations, however it is the negative connotations, that are seen most frequently in society and the workplace (Levine, 1988; Blair, 2000). What perpetuates these attitudes and stereotypes?

First and foremost is that America is a youth centered society (Blair, 2000). This is seen in devices such as TV, which seem to target youth. For instance in a study done on attitudes developed by watching TV, it was found that older adults are underrepresented. The study showed that only 2.3% of fictional characters were represented as age 65 or older in the world of weekly prime time television and only 1.4% on weekend prime time television for three different TV stations (Passuth & Cook, 1985). This is an amazingly small percentage, since adults age 65 or older made up about

11% of the American population at the time. Another study examined 40 episodes of ten different shows that children commonly watched, and found that out of only 24 characters age 65 and older, only 5 had regular roles and only 1 held a major character role (Holtzman & Akiyama, 1985). Another finding noted in this same study was that the frequency of appearance was very low for older characters and when older characters did appear it was only for a total of 3 hours, 27 minutes and 18 seconds out of all 40 episodes. American culture also seems to be preoccupied with looking young, shunning wrinkles, graying hair, baldness and other effects of aging (Blair, 2000). Most slogans for such youth rendering products commonly refer to being young, beautiful and healthy looking suggesting that old age is associated with ugliness and ill health (Palmore, 1990). Also most things built or designed are created with youth in mind. It has only been in the last decade that the human factors needs of the older adult has been considered in the design and utilization of the living and working environment (Czaja, 1990). Another occurrence of youth centrism is that our culture associates education and work with the young and retirement and leisure with the old (Levine, 1988). For instance a popular excuse for mandatory retirement is that due to limited job availability, retirement is needed so that the young have more room for advancement in industry (Levine, 1988). This fact seems to suggest that the old do not have to work or support dependents and that benefits and other income supplement full time work income, which is unfortunately untrue for most people (Blair, 2000).

This introduces a second factor that may perpetuate negative attitudes and stereotypes towards the elderly: retirement. Even as the number of elderly persons in America has increased considerably, the number of people 65 and older still working in

the workforce has decreased dramatically (Blair, 2000). The negative aspect of the older worker being out of the workforce is that there is no one to prove negative attitudes and stereotypes wrong. This also tends to limit everyday contact with older groups of people.

The final factor that may propagate negative attitudes and stereotypes is the growing segregation of the elderly. It used to be that families all lived together, possibly not in the same house, but generally within the same town or area. Now however, families are spread out and generally the elderly live alone more now than ever before (Blair, 2000). What this entails is less contact between generations and different age groups. Less contact translates into less understanding. For instance, it was found that in a study regarding physiognomic cues of aging (such as gray hair and wrinkles), those who had more contact with their grandparents tended to have more positive stereotypes than negative stereotypes associated with older individuals (Hummert, 1994). Older individuals also seem to be secluding themselves in the form of homogeneous housing (Passuth & Bengtson, 1988). An amazing number of adult housing communities can be seen for individuals who are age 65 and older, especially in Florida and California. These communities are beneficial in that they give the elderly the ability to be around their peers, however it can be harmful in its limiting interaction among generations that could result in other social complications that will be discussed among the social theories of aging.

All of the factors above (attitudes, retirement, and segregation) contribute to the possible proliferation of negative beliefs about older individuals despite the facts that are contrary to these negative beliefs. The following paragraphs will now discuss the attitudes, stereotypes, and past/present discrimination towards the elderly individual.

Attitudes towards aging and the elderly.

Attitude in this case refers to overall feelings towards old age and the elderly.

Elderly or old age has been defined in most cases as being 65 years and older.

One of the most comprehensive studies of attitudes towards aging and aging individuals was done by Louis Harris and Associates for The National Council on the Aging in 1975. Interviews were conducted of 4,254 in-person household interviews. The questions ranged from public attitudes to the politics of old age.

The first part of the study concerns attitudes towards old age in general. When participants were asked what the best years of a persons life were, their answers were widely varied with 69% of the total population split between the three age groups of the teens, 20's, and 30's. However only 2% of the total population picked the 60's and .5% picked the 70's. It seems that the majority of participants did not see the later years of life as being the best. When this smaller majority was asked why they considered the best years of a person's life to be in the 60's and 70's they associated that time of life with retirement, little responsibility/pressures, having more free time to appreciate and enjoy life more and the fact that children were grown up. When asked what the worse years in a persons life was, 21% of the population said the 70's and 18% said the teens. Hence, the older ages aren't necessarily viewed as the worst years of a person's life either. However those who chose the 60's and the 70's as the worst years of life associated that time with bad health, financial problems, not being able to get around, being dependent and a burden.

The public was also asked at what age a person becomes old. About half the public suggested a chronological age for being old but the other half suggested a

functional age. Such changes as getting sick, slowing down, wearing out, and showing visible signs of aging such as wrinkles and gray hair seem to constitute old age.

So how do the young see the old compared to how the old see themselves?

Participants 18-64 and 65 and older were shown lists of possible problems and asked how serious a problem they were for older people/themselves accordingly, there was a large discrepancy between the groups. For instance, 23% of people 65 and older stated that a “fear of crime” was a serious problem compared to 50% of the younger group feeling that it was a problem for people 65 and older. Twenty-one percent of the older group said, “poor health” was a problem compared to 51% of the younger groups. Fifteen percent of the older group said, “not having enough money to live on” very serious for them compared with 62% of the younger group feeling that it was a serious problem for them. Twelve percent of the older group said “loneliness” was a serious problem compared to 60% of the younger groups. In short young people hold very negative attitudes towards the expectation of old age and those who are old.

To sum up the conclusions of this study of the attitudes of people towards aging and old age is that while old age is not necessarily associated with the worst or the best part of life it is full of negative connotations and expectations. People of the young age group see growing old as being filled with exaggerated problems and consider this as being a possible burden, even though people 65 and older seem to state no real differences in the problems in their lives from those of the younger age group. This view of the old as a possible social and economic burden may blind society to the fact that older people can contribute positively to society and are still a viable and valuable resource.

Stereotypes.

Stereotypes are defined as “mistaken or exaggerated beliefs about a group” (Palmore, 1990). Stereotypes are learned from others, generally based on some semblance of fact (such as an unhealthy individual who is generalized to represent the population as a whole), and possibly survive because people fail to scrutinize them since they become engrained in culture as beliefs and are readily accepted at face value (Levine, 1988). There are both negative and positive stereotypes to most any group. The elderly however, seem to have more negative stereotypes than positive.

Several studies have been done to see what stereotypes are commonly ascribed to the elderly population. One such study was done by Tuckman and Lorge (1952) dealing with views that college students ascribed to older workers. They used a questionnaire of 51 statements about older workers and asked 147 students to indicate whether or not they agreed with the statements. The students were split up into two groups for the analysis, those under 30 years of age and those over 30 years of age. It was found that between the two groups the only significant difference in agreement was that a higher proportion of students under 30 years of age, believe that older workers will not take on additional responsibility. Other than that the views are relatively similar. In considering the total views of all participants, approximately two thirds or more agreed that older workers looked to the past, were slow, take longer to recover from illness and get over injuries, need more time to learn new operations, and are interested more in security than job advancement. Over half the participants agreed that older workers resist new ways of doing things, need longer rest periods more often, dislike working under younger

supervisors, are slow to catch new ideas, and are critical of younger workers. The group as a whole agreed with statements that cover resistance to new ideas and procedures. The statements that they agreed less with dealt with interpersonal and job relationship. For instance less than 5% believe that older workers take jobs away from younger workers, get all the breaks, spoil much of their work, have no ambition, cannot win the confidence and loyalty of fellow workers, and none agreed that they quit jobs frequently. This data also supports the fact that negative stereotypes are highly accepted among the population and may even be more so since many participants may have been reluctant to subscribe to statements that show negative bias.

Another study done by Hummert concentrated on the physiognomic cues of aging (1994). This study prescribed to the belief that age-related changes in facial structure affect social perceptions. Participants were asked to pair 24 photographs of aging individuals with sets of traits describing ten stereotypes of elderly individuals. The same photograph was allowed to go along with as many traits as the individual ascribed to it. The results showed that the frequency in which participants assigned a particular photograph to positive and negative stereotype categories varied significantly with the perceived age of the person in the photograph. Perceived age was calculated by a previous sorting task. Young-old (defined as individuals who are 55-65 years of age) individuals were paired with positive stereotypes 75% of the time whereas the old-old (defined as individuals who are 75 and over) individuals were paired with negative stereotypes 73% of the time. It is interesting to note that middle-old (defined as individuals who are 65-74 years of age) individuals were fairly equal in the split. More negative perceptions were seen with females than with males. Cues that were found to be

representative of aging were the degree of wrinkling, skin tone, amount of hair graying, and eye droop. Interestingly, hair loss did not distinguish aging for men.

It can be seen that negative stereotypes attributed to old age do affect perceptions of competence observed in older adults. A study done by Bieman-Copland & Ryan (2001) investigated social perceptions in failures in memory. This study's purpose was to answer the question of whether or not repetitious verbal behavior could elicit negative stereotypes about age, memory, and competence. For instance when normal memory failures occur in older adults, the failures tend to be attributed to lack of ability. This study used the social perceptions of repetitious verbal behavior to show this. In this case, the repetitious behavior was manipulated and participants were asked to estimate the person's age (who was stated as a female in each scenario) and to assess to what degree certain adjectives pertained to the individual. The author predicted that the presence of repetition in behavior would lead to higher age estimates and a more negative view of the individual. Their results supported their conclusion. First it is important to note that participant age influenced overall ratings of age with younger adults providing lower estimates of age and lower values of competence. This was also seen in a study by Louis Harris & Associates (1975). However although there were main effects for participant age, no significant interaction were found between participant age and the other variables. Even so, in both age groups of young and old participants, the woman who repeated herself was rated as being significantly older, less competent, and less likable than in the condition that contained no repetition. She was also seen as significantly older, less competent and more likable than her conversation partner, who also did not repeat herself. Note that in regards to benevolence, the conversant was seen as more likable

than her partner in both cases. In addition the woman who repeated herself was given significantly lower memory ratings than in the no repetition condition. Both conversations were designed with numerous examples of competence regardless of repetition, however the repetitive conversant was still seen to be less competent. In this study, older age was associated with more repetitious verbal behavior, which was also associated with more memory failures, less competence and more benevolent characteristics. This suggests that conversation behavior may contribute to perceptions of negative age stereotypes just as physical features do.

Negative beliefs associating incompetence with old age were also found in a study done by Kwong See, Wood, and Hoffman (2001). This study's purpose was to see if stereotypes associating old age with incompetence but enhanced honesty, would mediate the suggestibility of an older witness's testimony. Participants evaluated a female witness who was described as either 28 years of age or 82 years of age, on traits related to competence (in the form of accuracy) and honesty. The participants watched a set of shoplifting slides depicting a shoplifter lifting a book from a bookstore. Then they were to read a description of the incident taken from the witness (either young or old) and rate their competence and honesty. A misinformation paradigm was used to assess believability of the witness. The influence of the misinformation was measured by comparing memory for four items that were presented in a misleading way in the witness narrative with memory of four items presented in a neutral way. The more competence and honest a witness was perceived, the more influence the misinformation has on memory of the incident. It was found that participants perceived a witness described as young to be significantly more competent than a witness that was described as being old.

The distribution of the young witness's ratings of competence was higher than that of the old witness, with the young witness falling into the mid-range to high competence level and the old witness falling into all competence levels, however rarely falling on the high end. The older witness was also rated higher than the younger witness when honesty was analyzed. This suggests that negative beliefs may compromise the believability of older eyewitnesses.

Not only may negative stereotypes compromise perceived competence, but may also taint the way in which managers interact with older workers. Rosen and Jerdee (1977, p. 97) state, "In many cases, managers base their decisions about employees' qualifications on stereotyped views of age." Rosen and Jerdee used survey questionnaires, which were embedded in a decision-making exercise, to reveal to what extent such stereotypes influence managerial decisions. Three memorandums were used in the decision-making exercise dealing with ineffective behavior, requests for training funds, and promotion within the company. Each memorandum had two versions, one containing an older employee and one containing a younger employee. Each respondent received only one version of each memorandum and were asked to indicate how they would handle each incident by evaluating several approaches for solving the managerial problem.

In the first survey dealing with ineffective behavior respondents were asked how difficult would it be to correct such behavior and what approach they would take in dealing with the problem. In the young-version of the problem, the managers saw much less difficulty in changing the employee and took different administrative approaches to dealing with the problem. For instance, 66% of the respondents chose to have a talk in

which the younger employee was encouraged to change, where as in the old-version, 52% of the respondents chose to suggest that someone else handle the job. Respondents viewed older employees as less resistant to change and rigid in attitude. Instead of encouraging the older worker to change, they simply avoided the confrontation altogether by suggesting that someone else do the job. Rosen and Jerdee point out that this deprives the older employee of an opportunity to improve their performance and prevents the possibility of proving the stereotype wrong.

The second survey examined the assumption that older employees interest, motivation, and their capability to improve their job related skills decline. The respondents were asked to evaluate the employee's motivation for requesting training funds and the desirability of sending the employee to a training seminar. The younger employee was seen to be more concerned with keeping up with the latest technology, where as the older employee was seen as being more concerned with securing a fair share of the training budget. Furthermore about three fourths of the respondents recommended that funds be allocated, so that the younger employee could attend the seminar compared with about half for the older employee. Managers also recommended the decision to deny the request for funds significantly more often for older employees than for the younger one. This suggests that managers favor career development of the younger employee. Retraining is especially important for older employees since rapid advancements in technology tend to make both past knowledge and jobs obsolete. This sets forth a distinct disadvantage for employees who are not retrained.

The final survey was concerned with the assertion that older employees are seen to be less promotable in a position requiring creative and innovative thinking.

Recommended promotion as well as probability of success once promoted was assessed. In an off chute the survey also examined a second case where participants were asked to judge whether a new supervisory position should be created and then asked whether a candidate was suitable to the new position. Overall, respondents indicate that there is little support for promoting the older employee and once promoted, there is not as favorable an outlook on their success. In the second case, the majority of respondents chose to create a new supervisory position for the employee however again; the younger employee was more apt to be recommended for promotion. Rosen and Jerdee suggest that due to older employees lower probability of promotion, there is more chance for career stagnation and in so being past over, motivation will suffer. This as a result may contribute to encouraging behavior that will confirm this unpromotability, strengthening stereotypes further.

Stereotyping is when a person is judged on the basis of perceptions held about a group to which they belong (Robbins, 2001). This sort of generalization is normally constructive and helps simplify perception of the complex environment in which people live (Robbins, 2001). However, the world abounds with inaccurate stereotypes (Palmore, 1990). Negative stereotypes of the elderly are more prevalent than positive stereotypes. These stereotypes attributed to old age affect perceptions of competence observed in older adults. This in turn affects the interaction and decisions pertaining to older people in society. Such negative stereotypes often lead to discrimination whether it is conscious or unconscious (Palmore, 1990).

Mandatory Retirement and the age discrimination controversy.

Discrimination is described as the “act, practice, or an instance of discriminating categorically rather than individually: prejudiced or prejudicial outlook, action, or treatment (Merriam-Webster’s Collegiate Dictionary, 1994, p 332).” Such discrimination may be positive or negative, however this section refers to negative discrimination due to stereotypes and prejudice.

Discrimination in employment may take many forms. Employers may refuse to hire or promote older workers. Employers may also force retirement of older employee regardless of their ability to keep working. Evidence of such discrimination has been seen through the facts that older workers stay unemployed much longer than younger workers, are less likely to be promoted, experience greater wage loss in a subsequent job despite experience, and are more likely to quit looking for another job after a layoff (Palmore, 1990). One of the most far-reaching appearances of discrimination however, has been mandatory retirement of older workers.

Mandatory retirement has been one of the most controversial issues dealing with age discrimination in employment (Levine, 1988). Many do not even count it as age discrimination, but explain it as being a form of statistical discrimination (Posner, 1995). Either way in 1967 the United States government saw fit to enact the Age Discrimination in Employment Act (ADEA) which protected workers up to age 65. In 1978 the act was amended to include workers up to age 70 in the private sector and to older workers without maximum limit in most government positions. Finally in 1986 an amendment was enacted that abolished mandatory retirement for most employees in the private and government sectors. However some occupations still encompass mandatory retirement

since the ADEA exempts occupations where an employer can prove that age is a bona fide occupational qualification. An apt example of this is the “Age 60 Rule” which prohibits airline pilots from piloting commercial aircraft after their 60th birthday (United States General Accounting Office, 1989). Even with the legislation abolishing mandatory retirement, most workers are still expected to retire at age 65 and are in fact encouraged by companies through pensions and other forms of compensation by employers and if older workers do chose to continue to work, they are not allowed to draw all of their benefits from the government and are in this way penalized (Levine, 1988).

Mandatory retirement and other discriminatory practices may have harmful results even when they are not forced, but are compulsory on the part of the individual or the employer. With the discontinuation of productive work, older unemployed workers experience feelings of uselessness, isolation and loneliness, and generally have poorer health than older workers who are still employed (Levine, 1988).

There is also a factor of forced poverty that such practices create (Blair, 2000). Such retirement practices also reinforce stereotypes by eliminating able older adults from the workforce and their ability to evince the stereotypes lack of credibility by sheer participation (Levine, 1988; Palmore 1990, Blair, 2000). In fact most workers not only do not wish to retire, but even when they do they continue on in part time employment (Louis Harris & Associates, 1976) and voluntary programs for which they often do not receive credit for active participation (Blair, 2000).

Social Theories Of Aging

In taking into consideration the above occurrences of positive and negative views towards aging, many social theorists have tried to explain the social aspects of aging. There are three main sociological theories that contain aging theories that apply to perceptions of aging. These are structural functionalism, exchange theory, and symbolic interaction.

Structural Functionism

Theories based on structural functionism view aging in terms of its function in the structure of society. Specific concerns are for social norms, roles and socialization. The main theories based on this view are disengagement theory, modernization theory, and age stratification.

Disengagement theory.

Disengagement theory describes an older person's withdrawal from certain roles in society (Cumming & Henry, 1961). Their withdrawal is seen as inevitable and as a preparation for a total withdrawal from society, meaning death. By withdrawing from society, disengagement allows the older person free to die without disrupting vital affairs. An example of such withdrawals would be retirement, hence making room for the younger population in the workforce to take up leadership responsibility. Cummings and Henry also cite statistics of decreased interaction in the form of fewer and less intense social contacts and less emotional involvement. This theory has undergone a lot of criticism in that it relies on an older persons willingness to just fade away. Also as seen in

our own government, older individuals are commonly found in positions of leadership and still contribute an important role to society. However discredited this theory has become; it has led to some major advancement in other areas in developing theories describing social involvement and activity in a person's satisfaction with old age.

Modernization theory.

This theory describes changes in age status based on the amount of industrialization in a society (Cowgill, 1974). The more industrialization in a society the lower the status of the aged. For instance, in an agricultural society youngsters were put to work as soon as possible and there was no concept of retirement (Blair, 2000). Older people worked until they were no longer able. They were valued and respected for their knowledge and experience. Whereas after the industrial revolution older workers found their skills and experience not applicable to new technologies and since jobs were physically demanding, structured with long hours, many older workers lost their place in the workforce to younger workers (Blair, 2000).

Cowgill (1974) outlines four areas of modernization that contribute to the lower status of the elderly. These are health technology, economic technology, urbanization, and mass education. Health technology contributes by the fact that in preindustrial times, people generally did not live much past their 40's. Those that did were considered to be wise and had much more knowledge and experience (Posner, 1995). However in industrial times those that live longer are thought to be a burden on society since they are retired and generally rely on government programs to supplement their income (Louis Harris & Associates, 1976; Posner, 1995). Accordingly, economic technology causes

skill obsolescence. This contributes to degraded status in older individuals, requiring them to be retrained in some other discipline. Along the same lines are education and urbanization. During preindustrial times the elderly were still the most knowledgeable, whereas in modern times the young are more highly educated. Finally in preindustrial times the oldest individual was usually head of the family and made all major decisions acting as a form of self-government since sparse settlements caused isolation. This lasted until urbanization evolved and communities/governments were formed. Modernization theory does seem to have some basis, however it has also been seen that variations in experiences of the elderly depend on factors such as gender, race, ethnicity, social class, religion and historical period etc. (Quadagno, 1982).

Age stratification.

The age stratification model suggests that each birth group develops its own cohort (Riley, Johnson, & Foner, 1972). Each birth cohort has its own characteristics that are shaped by particular historical events that shape the attitudes of people within that group. For instance the feminist movement, the ending of racial segregation, and the differing circumstances between the World Wars and Vietnam all have affected the differences in attitudes between baby boomers and the generations before them. Age stratification goes on further to explain that within each individual's life course, a person moves from one stage to another stage taking on a succession of allocated roles for that particular age group that they are in. An example of this can be seen in that education is allocated to the young and work is allocated to the next age group and in today's case

retirement is allocated to those 65 years and older. These cohorts can affect the perceived outcomes of different studies if they are not taken into account.

Exchange Theory

Exchange theory concentrates its focus on the immediate interaction between older people and other age groups (Dowd, 1975). Interaction in this case is seen as being full of costs and benefits that each member contributes or takes from another. In the case of the elderly, they are seen as less educated, having lower income, and poorer health. Hence, these fewer resources result in interaction with the elderly becoming more costly for younger groups. This is theorized to result in the elderly decreasing their participation in social life. Only those who maintain these resources are the ones who persist in frequent social interaction. Dowd sees all interaction in terms of economics in that they are all associated with costs versus benefits, however the number of interactions is all that is assessed, not the quality of these same interactions.

Symbolic Interaction Theories

Theories based on symbolic interaction take into account self meaning evolved from the interactions and the interpretations of others (Passuth & Bengtson, 1988). It has been suggested that the social context perceived by an individual is more important than the actual content itself and that interpretation of reality beginning at the individual level often becomes social reality when it is shared with others (Reker & Wong, 1988). This in turn creates widely shared social realities that form the basis for social definitions and it is these over generalized social definitions that lead to social stereotypes (Reker & Wong,

1988). Such interactions can lead to individuals proving stereotypes correct since they see themselves through the eyes of others who believe in these stereotypes and they create themselves in that image. For example, just the saying of “Act your age” involves social pressures to conform to social images during interaction. There are three theories that describe components of symbolic interaction and the development of sense of self as people age. These are activity theory, social competence and breakdown theory, and subculture theory.

Activity theory.

In short, activity theory says that the more social interaction a person undergoes the more satisfied they are with life. Furthermore the type of interaction seems to make a difference for the elderly in terms of well being depending on whether the activity is formal, informal, or solitary (Lemon et al. (1972). This theory is based on the assumption that a person is defined by the social roles in which they interact (Reker & Wong, 1988). As people age, they lose social roles such as head of household, parent, and strive to define themselves as elders.

Social competence and breakdown theory.

Kuypers & Bengtson (1973) explain that a psychologically vulnerable elder who receives negative messages from society may incorporate those messages whether true or not into their view of themselves and in turn produces negative feedback and circular thinking. These crises may be in the form of loss of health, loss of spouse or just a general loss of role identification possibly induced from retirement or other life change.

An example of this would be an elderly individual whose self image is vulnerable due to role loss and negative stereotypes and who experiences a crisis of ill health. Kuypers & Bengtson hypothesize that such a crisis may lead to the labeling of the individual as dependent by the social environment, health professionals and or family. Skills in which the individual were once competent degrade. Because of this the individual adopts the self-concept of being inadequate, sick, and incompetent which in turn leads to even more vulnerability in the individual and starts the cycle over again. In effect their image of incompetence prohibits the individual from being competent or regaining certain competencies back. Such occurrences further degrade both social and psychological competence. It is believed that using what Kuypers and Bengtson term as a “social reconstruction syndrome” may reverse this breakdown in competence. It is suggested that improving environmental supports while encouraging expressions of personal strength may foster a sense of increased competence.

Subculture theory.

This theory describes the aged as developing their own subculture in American society through the impact of social norms developed through the interactions with others (Rose, 1964). The theory goes on to state that this subculture results from older people’s exclusion from interactions with other age groups, their increased interaction with each other and their common beliefs and interests as seen in age cohorts. Such a claim seems to be corroborated with the increased age-homogeneous housing, and the development of age-activist groups such as the American Association of Retired Persons (AARP), Seniors USA, and Gray Panthers.

Summary

The United States' demographical make up is rapidly changing (U.S. Census Bureau, 1996). Older people in American are better educated and healthier than they have ever been in its history (Blair, 2000). There is a marked growth of the elderly as a result (U.S. Census Bureau, 1996). Partly because of this, more studies have concentrated on the aging population (Czaja, 1990).

These studies have concluded that some faculties of cognition decline while others do not (Horn & Cattell, 1966). Studies also indicated that chronological age is a poor indicator of performance and that as people grow older individual variance increases (Levine, 1988; Waldman & Avolio, 1986; Morrow & Leirer, 1997; Tsang, 1992; Lassiter et al., 1997; Blair, 2000). Studies suggest that performance does seem to decline in certain cognitive and physical instances as people age, however this decline is influenced by many factors, which allow older people to evince a competency and performance at least equal and in some instances better than younger people (Waldman & Avolio, 1986; Willis & Schaie, 1986; Sparrow & Davies, 1988; Tsang, 1992, 1995, 1997; Tsang & Shaner, 1998; Morrow et al. 1999; Morrow & Leirer, 1997; Salthouse, 1990; Hultsch & Dixon, 1990; Staudinger & Pasupathi, 2000). Some of these factors include health and life style of the individual, experience, training, and motivation. A point not to be taken lightly is that rarely are job capabilities required that reach the critical limit of the worker even after performance declines due to aging (Levine, 1988). It has also been illustrated that while old age is not seen as the worst part of life, it is full of negative connotations (Louis Harris & Associates, 1976). People perceive older individual's problems as greater than they actually are (Louis Harris & Associates, 1976) and view older people as

being more resistant to change and as having difficulty learning new things (Tuckmon & Lorge, 1952 and Rosen & Jerdee, 1977). This exemplifies the fact that there are more negative stereotypes attributed to age than positive stereotypes (Posner, 1990 and Hummert, 1994). These negative stereotypes have also been seen to affect perception and how people deal with the elderly (Bieman-Copland & Ryan, 2001; Kwong See, Wook, & Hoffman, 2001; and Rosen & Jerdee, 1977).

The persistence of negative attitudes and stereotypes of older people in the face of contrary evidence may be attributed in large part to selective perception (Palmore, 1990). In using selective perception, people “interpret what they see on the basis of their interests, background, experience, and attitudes (Robbins, 2001, p.127).” In doing so many people see what they expect to see regardless of what is really there. For instance most people do not know what a person’s chronological age is and tend to estimate age pertaining to physiognomic cues such as wrinkling and gray hair (Hummert, 1994). Even though such a person is physically active and currently working productively, they may be perceived as feeble and old if they evident such cues pertaining to stereotypes regardless of their actual age. It can be seen that in such instances, people’s perceptions tend to confirm their stereotypes because they only perceive those as being old who fit their stereotypes of old people (Palmore, 1990). In fact there are prime examples that break stereotypes. A few figures that contributed significantly while old in age are Sigmund Freud, Jean Piaget, Michelangelo, Grandma Moses, Pablo Picasso, and Frank Lloyd Wright (Perlmutter, 1988). In more recent times Blair (2000) reviews significant achievements by John Glenn who returned to space at age 77; Alan Greenspan who was reappointed to oversee the American economy at age 71; Benjamin Franklin who helped

draft the Declaration of Independence at age 70; and even in the presidency of Ronald Regan who ran two terms in office which ended when he was 78 years of age. These examples are prime evidence that older adults have contributed to society and continue to accomplish great achievements despite advanced age.

Statement of the Hypothesis

Though aging has been shown to degrade performance, older adults may still perform as competently as younger adults. Even though there are numerous data as evidence that this may be true, older adults may still be perceived as less competent than younger adults by the general population. In the present study, perceptions of pilot competence depending on age are examined. H₁: It is expected that age will influence perceived competence. H₂: It is predicted that older pilots will be perceived as less competent overall than will younger pilots. H₃: Additionally, both younger and older participants will perceive older pilots as less competent when compared to perceptions of an unspecified aged pilot; H₄: however the older participants will perceive older pilots as less competent to a lesser degree than will younger participants. It is also expected that H₅: overall participants will attribute blame to external causality and attribute success to internal causality. H₆: However attribution of success for young pilots will be attributed to internal causality and attribution of success for old pilots will be attributed to external causality. The opposite will be true for attribution of blame. H₇: Attribution of blame for young pilots will be attributed to external causality and attribution of blame for older pilots will be attributed to internal causality. H₈: This effect will be less pronounced when the young and old pilots are evaluated by their respective age groups.

Design

To test the first 4 hypotheses, a 3 (scenario) X 3 (participant age) between groups design was used in this study. A between subjects design for the variables age group and scenario was utilized to limit possible bias effects due to participants delving the reason for the study in advanced of the debrief, since results could be confounded by participant's reluctance to show bias in their perception of the individual. The first independent variable is age of the pilot in the scenario. The three levels of the independent variable are old, young and unspecified. A control condition has been included so that the scores of the age specific scenarios can be compared to the non-age specific scenario. The control condition is the unspecified scenario. The 2nd independent variable is the age of the participants (18-34, 35-55, 56≤). The split in participant age groups were delineated in such a way as to show a young age group, a middle age group, and an old age group that was approaching retirement or that was retired. The stage of life and or working career has been shown to lend to perceived differences between age groups (Louis Harris and Associates, 1976). To test the last 4 hypotheses, a 3 (scenario) X 3 (participant age) X 2 (causality) mixed between-within subjects design was used. A within subjects design for the 3rd independent variable, causality, was utilized to investigate attribution of blame and success.

The dependent variables are ratings of five areas of pilot ability. These areas are: Competence, Effectiveness, Blame, Avoidability, and Attribution to internal and external causality within the context of the provided scenario. Also assessed is the amount of apprehension or willingness to fly with the captain again.

Method

Part 1: Age Assessment

Participants

Participants were 50 (36 females and 14 males) adults randomly selected from Embry-Riddle Aeronautical University, the University of Central Florida and JCPenney (Volusia Mall, Daytona Beach, FL). The participants ranged in age from 18 to 67, with an average age of 33 years.

Materials

Independent variables.

Fifty-five photos were selected from the Internet and magazines based on physiognomic cues of the young and old, such as the presence and color of hair, condition of skin (wrinkled vs. smooth), and the structure of facial features (Hummert, 1994). All photos were selected to represent individuals of good health. The photos were enlarged or reduced so that they were the same size, duplicated and glued onto index cards. All photos were full head shots of Caucasian adult males. The photos were numbered 1 thru 55 to correspond with an answer sheet given to the participants.

Dependent variables.

A separate answer sheet was included with the photos (see Appendix A) for participants to record their answers. The answer sheet was numbered 1-55 to correspond with a particular photo. Participants rated each photos according to perceptions of

apparent age and physical attractiveness. Demographical information about the participant was also included at the bottom of the questionnaire.

On the answer sheet physical attractiveness was rated utilizing a Likert scale in the form of “1” being the least attractive and “10” being the most attractive. Apparent age was left as a write in question instead of a categorical question, in order to achieve a more accurate response of the participant’s perception of apparent age.

Procedure

A packet was given to each participant consisting of a consent form (see Appendix B), a packet of 55 photos, and an answer sheet. Each participant was instructed to fill out the consent form before proceeding with the rating task. The participants were ensured that their answers would be completely confidential. A set of standardized instructions were read to the participants (see Appendix C) in which they were asked to choose only one rating per category per photo. The participants were ensured that there was no right or wrong answers. Participants were then debriefed (see Appendix D) and thanked for their participation.

Based on participant response, the photos were grouped into three categories: 23-35, 56-65 and Other. The age of 23 years was used as a minimum age requirement for the apparent age category, since the FAA has mandated that the minimum age limit to be certified as an Airline Transport Pilot (ATP) is 23 years of age. An ATP is required for a pilot to become captain of a commercial airliner. Also since the Old Captain Scenario is based on a retiring captain of 60 years of age, the 56-65 age category was constructed to reflect this criterion. The “Other” age category was utilized to group and eliminate

inappropriate middle aged and borderline photo representations from being selected for Part II.

In order to be selected for Part II three requirements had to be met. First, a photo had to be rated by 2/3rds of the participants as being in the 56-65 and 23-34 age categories. Second, the ratings of physical attractiveness for the photo had to equal a 5 on a 10-point Likert scale denoting average physical attractiveness. It has been shown in previous studies that attractiveness level influences perceptions of individuals on many levels. Because of this effect a rating of 5 has been chosen to eliminate this possible confound. Thirdly, the two pictures had to have the highest percentage of age agreement as well as similar physical characteristics such as weight and whether or not they wore glasses.

Based on these requirements, one photo of a young male from the 23-35 category age group and one photo of an old male from the 56-65 age group were selected for Part II. The young photo had an age agreement percentage of 78% and the old photo had an age agreement percentage of 68%. Both photos averaged a 5.5 on the physical attractiveness scale.

Part 2: Scenario Questionnaire

Participants

Participants were 180 (20 adults per age group per scenario) adults from the University of Central Florida, Embry-Riddle Aeronautical University, JC Penney Corp (Volusia Mall, Daytona Beach, FL) and the Northrop Grumman Corporation (Bethpage, NY and Melbourne, FL). Subjects were split up into three age groups 18-34, 35-55, 56

and over. Mean ages within the groups were 24 years, 44 years, and 66 years respectively. There were a total of 88 males and 92 females surveyed.

Participants were surveyed as to their background in aviation to ensure that a good representation of the traveling public was captured. It was expected that some participants might have qualifications that are not attributed to the general population in the United States (e.g. such as not being a U. S. citizen or being a certified pilot). These participants were excluded on the grounds that culture and personal educational experience may affect perceptions. The median number of domestic flights made by participants was 2 per year.

Materials

Independent variables.

Three scenarios were constructed (see Appendix E). The three scenarios depicted a situation in which a pilot that was flying a commercial airliner completed a successful landing in difficult weather conditions. The scenarios differed only in that the pilot was described as being old, young, or an unspecified age. Pilot experience was held constant in all scenarios. A photo of an old pilot accompanied the “old pilot” scenario. A photo of a young pilot accompanied the “young pilot” scenario. The unspecified age scenario was not accompanied with a photo. The photo for the unspecified scenario was left out so that the age of the pilot would not be implied. Gender of the captain was male since the majority of today’s pilots are still typically male. Also the perception of females has been shown to have more negative stereotypes associated with them; hence it was

decided to have a male pilot in each scenario to limit possible confounding effects of gender on age (Lutsky, 1980; Hummert, 1994).

The questionnaire adapted from Paulsen (2002) & Dukes et al. (1991) see Appendix F, also included independent variables for the Internal and External Causality. Internal causality variables are those variables that the pilot has a direct influence in. External causality variables are those variables that the pilot has no direct influence in. Categories used to assess Attribution consisted of internal causality variables: Captain, Aircraft, Delay Time, Effort and Ability and external causality variables: Weather, Airport, Luck, and Task Difficulty.

Dependent variable.

This questionnaire assessed five areas of pilot ability. These areas are: competence, effectiveness, avoidability, and attribution of blame and success from the perspective of external and internal causality within the context of the provided scenario. Defining each area within the instructions for the scenarios ensured definitional compatibility among participants.

Responses for the questionnaire were recorded by using a Likert scale in the form of “1” being the lowest and “7” being the highest for questions pertaining to effectiveness, competence, avoidance, and willingness to continue the flight with the same captain. Attribution of internal and external causality questions were recorded by means of percentage assignment. The questionnaire also assessed demographic information including participant age, sex, nationality, pilot certification, and flight experience.

Procedure

A packet was given to each participant consisting of a consent form, one of three scenarios, a photo (no photo in the case of the unspecified scenario), and a questionnaire. Each participant was instructed to fill out the consent form before proceeding with the questionnaire and was assured that their answers would be completely confidential. A set of standardized instructions was read to the participants (see Appendix F). For questions that were assigned percentages, they were told to assign the percentages in multiples of 10, with the total equaling 100 percent. The participants were not informed of the focus of the study. Participants were then debriefed and thanked for their participation.

Results

Perception of Competence

For robustness of design competence was investigated by a direct question about perceived competence and indirectly by questions of perceived effectiveness and perceived avoidance ability. The following hypotheses relate to these first three variables.

- H₁: It is expected that age will influence perceived competence.
- H₂: It is predicted that older pilots will be perceived as less competent overall than will younger pilots.
- H₃: Additionally, both younger and older participants will perceive older pilots as less competent when compared to perceptions of an unspecified aged pilot;
- H₄: however the older participants will perceive older pilots as less competent to a lesser degree than will younger participants.

Several 3X3 between-group ANOVAs were conducted to explore the impact of scenario (Young, Old, and Unspecified Captain) and participant age (18-34 years; 35-55 years; 56 years and above) on perceptions of Perceived Effectiveness, Competence and Avoidance. Participant apprehension for continuing the flight was also investigated. Their results are below.

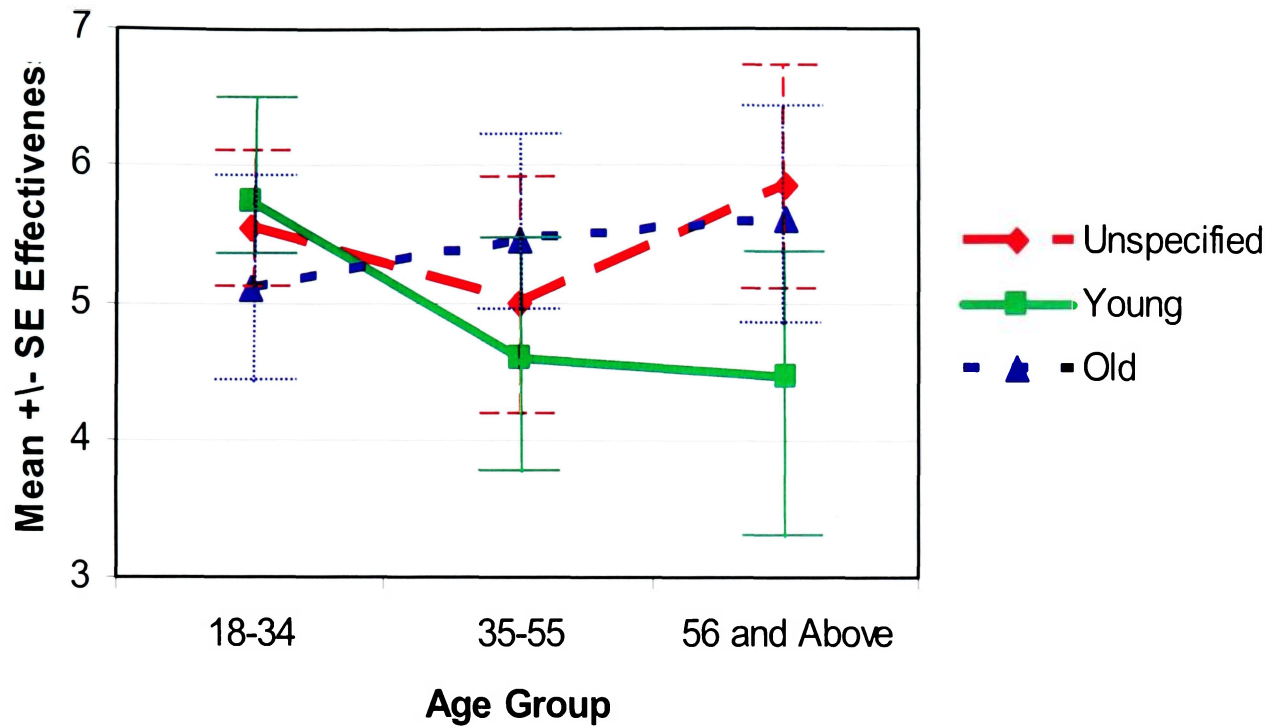
Table 1: Means for Effectiveness

Scenario	18-34	35-55	56≤	Total
Unspecified	5.55	5.00	5.85	5.47
Young Captain	5.75	4.60	4.45	4.93
Old Captain	5.10	5.45	5.60	5.38
Total	5.47	5.02	5.30	5.26

Perceived Effectiveness

In examining the data for Perceived Effectiveness, there were no significant main effects by Scenario, $F(2, 171) = 2.219$, $p = .112$, or by Age Group, $F(2, 171) = 1.395$, $p = .215$. Neither participant age nor pilot age alone affected Effectiveness regardless of manipulation. However the analysis showed an interaction effect for Age Group X Scenario, $F(4, 171) = 2.706$, $p = .032$, $\eta^2 = .060$, power = .741. Thus 6% of the variance in perceived effectiveness is accounted for by participant age. The marginal means for effectiveness are shown in Table 1.

The 18-34 years age group perceived the Old Captain as being the least effective and the Young Captain as being the most effective. The opposite perception was shown for both the 35-55 years age group and the 56 years and above age group. This indicated that the age of the captain in the scenario impacted perception of Effectiveness differently for the three age groups. For the Old Captain, as participant age increased so did the effectiveness ratings. However for the Young Captain, as participant age increased effectiveness ratings decreased. This inverse relationship is shown in Figure 1.

Figure 1: Estimated Marginal Means of Effectiveness

Both the 18-34 years age group and the 56 years and above age group perceived the Older Captain as less effective than the Unspecified Captain. This was not the case for the 35-55 years age group.

These apparent differences were examined using pairwise comparisons with the Bonferonni correction. A significant difference was found in the Young Captain Scenario. The 18-34 years age group rated the Younger Captain as having a significantly higher effectiveness score than both the 35-55 years (Mean Difference = 1.15, $p = .047$) and 56 years and above (Mean Difference = 1.30, $p = .019$) age groups. Pairwise

comparisons between the Old Captain Scenario, the Unspecified Captain Scenario and the age groups showed no significant differences.

Table 2: Means for Competence

Scenario	18-34	35-55	56<	Total
Unspecified	5.80	5.05	6.25	5.70
Young Captain	5.75	5.35	4.50	5.20
Old Captain	5.55	5.95	6.05	5.85
Total	5.70	5.45	5.60	5.58

Perceived Competence

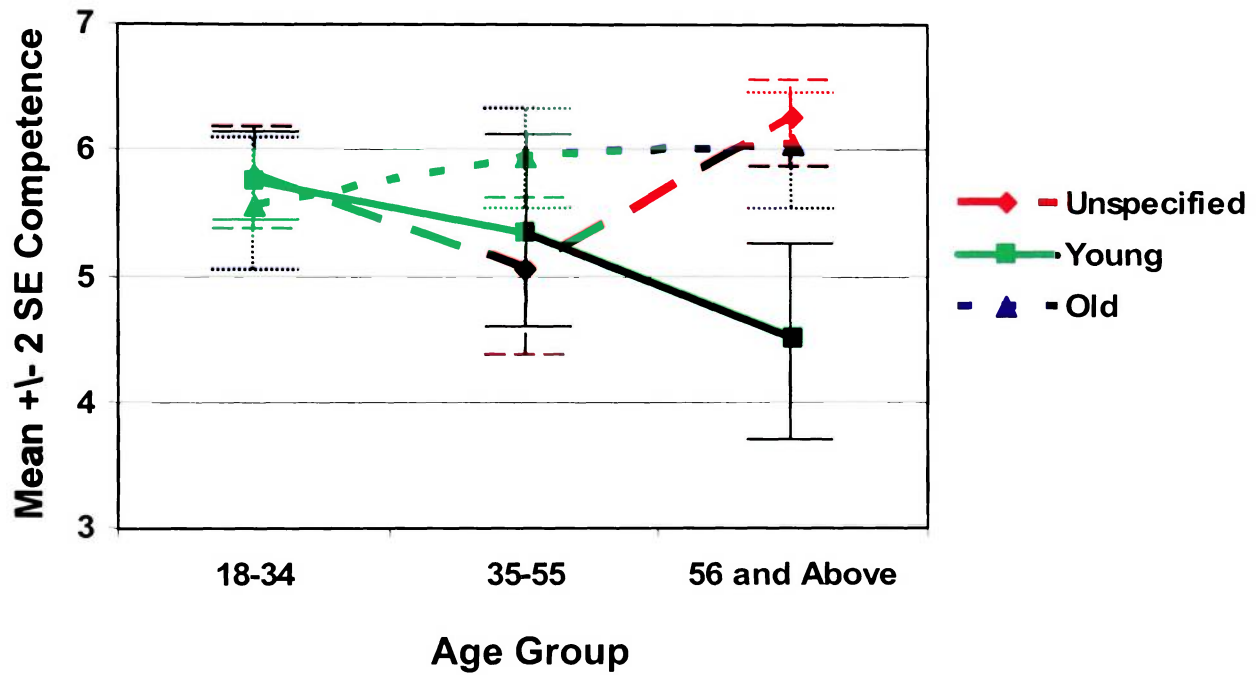
A statistically significant main effect was found for Perceived Competence by Scenario, $F(2, 171) = 4.715$, $p = .010$, $\eta^2 = .052$, power = .565. Pilot age accounted for 5.2% of the variance in perceived competence. Post-hoc comparisons indicated that the mean competence scores for the Young Captain ($M = 5.20$, $SD = 1.55$) were significantly less than for the Old Captain ($M = 5.85$, $SD = 1.05$). The Unspecified Captain ($M = 5.70$, $SD = 1.15$) did not differ significantly from either of the other groups. The marginal means for Competence is shown in Table 2.

There was no significant main effect for Age Group, $F(2, 171) = .645$, $p = .526$.

An Age Group X Scenario interaction effect was also found for Perceived Competence, $F(4, 171) = 5.411$, $p = .000$, $\eta^2 = .112$, power = .901. This indicated that 11.2% of the variance was accounted for by a combined effect of pilot age and participant age. It appears that, the 18-34 years age group perceived the Old Captain as being the least competent and the Young Captain as being the most competent. The opposite perception appears for both the 35-55 years age group and the 56 years and

above age group. By scenario, as participant age increased so did the competence scores for the Old Captain. However, for the Young Captain, as age of the participant increased competence scores decreased. This inverse relationship is shown in Figure 2.

Figure 2: Estimated Marginal Means of Competence



These apparent differences were examined via pairwise comparisons utilizing a Bonferonni correction. The 35-55 years age group perceived the Unspecified Captain as being significantly less competent than did the 56 years and above age group (Mean Difference = -1.20, $p = .006$). The Young Captain was perceived as having significantly higher competence by the 18-34 years age group as compared to the 56 years and older

age group (Mean Difference = 1.25, $p = .004$). There were no significant differences in perceptions of competence of the Old Captain by age group.

Table 3: Means for Avoidance

Scenario	18-34	35-55	56<	Total
Unspecified	3.55	3.70	2.75	3.33
Young Captain	3.25	3.95	4.30	3.83
Old Captain	3.60	2.65	3.45	3.23
Total	3.47	3.43	3.50	3.47

Perceived Avoidance Ability

Perceived Avoidance showed no significant main effects for Age Group, $F(2, 171) = .019$, $p = .981$ or Scenario, $F(2, 171) = 1.803$, $p = .168$. There was also no Age Group X Scenario interaction effect for Perceived Avoidance, $F(4, 171) = 2.338$, $p = .057$, $\eta^2 = .052$, power = .669. The marginal means for Avoidance are shown in Table 3.

Table 4: Means for Perceived Apprehension in Continuing the Flight

Scenario	18-34	35-55	56<	Total
Unspecified	4.00	3.90	2.85	3.58
Young Captain	3.85	4.35	3.60	3.93
Old Captain	3.80	3.60	2.55	3.32
Total	3.88	3.95	3.00	3.61

Perceived Apprehension in Continuing the Flight with the Same Captain

A main effect was found for Perceived Apprehension by Age Group, $F(2, 171) = 5.033$, $p = .008$, $\eta^2 = .056$, power = .811. Post-hoc comparison using Tukey HSD, revealed that there was a significant difference between the mean scores of the 56 years and above age group ($M = 3.00$, $SD = 1.89$) and that of both the 18-34 years age group ($M = 3.88$, $SD = 1.69$) and the 35-55 years age groups ($M = 3.95$, $SD = 1.90$). As participant age increased the amount of apprehension the participant felt about continuing the flight tend to decrease. However the 18-34 years age group and the 35-55 years old age groups did not differ significantly from each other. No significant Age Group X Scenario interaction effect, $F(4, 171) = .474$, $p = .755$, or main effect for Scenario, $F(2, 171) = 1.712$, $p = .184$, was found. Mean scores for Apprehension are illustrated in Table 4.

Attribution of Internal/External Causality

The questionnaire had two questions each to investigate attribution of internal and external causality for the dependent variables, Blame (Question 1: Blame, Question 2: Encountering Adverse Conditions) and Success (Question 1: Role in Successful Landing, Question 2: Captains Achievement of Success). The first question of each dependent variable dealt with attribution on a general categorical level. Internal causality consisted of Captain, Aircraft and Delay Time. External causality consisted of Weather and Airport. The second question of each dependent variable dealt with attribution on a personal level. Internal causality consisted of Ability and Effort. External causality consisted of Luck and Task Difficulty.

The data from this portion of the study was analyzed with several 3X3X2 mixed between-within ANOVA. The purpose was to explore the impact of scenario (Young, Old, and Unspecified Captain), participant age (18-34 years; 35-55 years; 56 years and above) and Causality. Scenario and participant age are the between-group variables and Causality is the within-group variable. Since the data violated the assumption of sphericity, the Greenhouse-Geisser statistic was used to analyze the data. The following hypotheses are related to these variables.

- H₅: Overall participants will attribute blame to external causality and attribute success to internal causality.
- H₆: Attribution of success for young pilots will be attributed to internal causality and attribution of success for old pilots will be attributed to external causality. The opposite will be true for attribution of blame.
- H₇: Attribution of blame for young pilots will be attributed to external causality and attribution of blame for older pilots will be attributed to internal causality.
- H₈: This effect will be less pronounced when the young and old pilots are evaluated by their respective age groups.

**Table 5: Means for Internal & External Causality, Q1 Blame
(Role in Encountering Incident)**

Internal Causality				
Scenario	18-34	35-55	56<	Total
Unspecified	30.25	38.75	22.50	30.50
Young Captain	28.75	33.00	36.00	32.58
Old Captain	34.00	33.25	26.00	31.08
Total	31.00	35.00	28.17	31.39
External Causality				
Unspecified	69.25	61.25	78.00	69.50
Young Captain	70.75	67.00	63.00	66.92
Old Captain	68.00	66.75	74.00	69.58
Total	69.33	65.00	71.67	68.67

Attribution of Causality for Blame

The analysis of Q1 for blame indicated a main effect for Causality (utilizing the Greenhouse-Geisser statistic), $F(1, 171) = 105.542$, $p = .000$, $\eta^2 = .375$, power = 1.000. There was a significant difference between internal and external causality.

Overall participants placed more blame on external causality (68.67%) than on internal causality (31.39%). There were no significant main effects for Age Group, $F(2, 171) = 209$, $p = .812$, $\eta^2 = .002$, power = .418 or for Scenario, $F(2, 171) = 1.104$, $p = .334$, $\eta^2 = .013$, power = .242.

There were no significant effects for the two way interaction for Causality X Age Group $F(2, 171) = 1.141$, $p = .322$, $\eta^2 = .013$, power = .249 or Causality X Scenario $F(2, 171) = .161$, $p = .851$, $\eta^2 = .002$, power = .075, nor a significant interaction effect indicated for Age Group X Scenario, $F(4, 171) = .880$, $p = .477$, $\eta^2 = .020$, power = .276.

Causality X Scenario X Age Group also did not show a significant effect, $F(4, 171) = 1.054$, $p = .381$, $\eta^2 = .024$, power = .328. Means for Blame Q1 are listed in table 5.

**Table 6: Means for Internal & External Causality, Q2 Blame
(Encountering Incident)**

Internal Causality				
Scenario	18-34	35-55	56≤	Total
Unspecified	27.25	43.25	31.75	34.08
Young Captain	39.50	37.00	48.00	41.50
Old Captain	33.25	26.50	37.00	32.25
Total	33.33	35.58	38.92	35.94
External Causality				
Unspecified	72.75	56.75	65.25	64.92
Young Captain	63.00	63.00	47.00	57.67
Old Captain	65.25	72.00	63.50	66.92
Total	67.00	63.92	58.58	63.17

Q2 Blame, attribution of blame for encountering incident, revealed a significant main effect for Causality (utilizing the Greenhouse-Geisser statistic), $F(1, 171) = 26.511$, $p = .000$, $\eta^2 = .134$, power = .999. Overall participants placed more blame on external causality (63.17%) than on internal causality (35.94%). However there were no significant main effects for Age Group, $F(2, 171) = 1.189$, $p = .307$, $\eta^2 = .014$, power = .258 or for Scenario, $F(2, 171) = .005$, $p = .995$, $\eta^2 = .000$, power = .051.

There were no interaction effects for Causality X Age Group $F(2, 171) = .595$, $p = .553$, $\eta^2 = .007$, power = .148 or for Causality X Scenario $F(2, 171) = 1.137$, $p = .323$, $\eta^2 = .013$, power = .248. Age Group X Scenario did not show a significant interaction effect either, $F(4, 171) = 1.173$, $p = .324$, $\eta^2 = .027$, power = .363.

Causality X Scenario X Age Group did not show a significant effect, $F(4, 171) = .854$, $p = .493$, $\eta^2 = .020$, power = .269. Means for Blame Q2 are listed in table 6.

**Table 7: Means for Internal & External Causality, Q1 Success
(Attribution of Success)**

Internal Causality				
Scenario	18-34	35-55	56+	Total
Unspecified	89.00	90.75	92.00	90.58
Young Captain	87.50	85.35	83.75	85.53
Old Captain	87.00	91.25	87.25	88.50
Total	87.83	89.12	87.67	88.20
External Causality				
Unspecified	10.25	9.25	8.00	9.17
Young Captain	12.50	14.65	13.75	13.63
Old Captain	13.00	8.75	12.75	11.50
Total	11.92	10.88	11.50	11.43

Attribution of Causality for Success

Attribution of Success Q1 indicated a significant main effect for Causality (utilizing the Greenhouse-Geisser statistic), $F(1, 171) = .1144.115$, $p = .000$, $\eta^2 = .870$, power = 1.000. Overall participants placed more attribution of success on internal causality (88.20%) than on external causality (11.43%). There were no significant main effects for Age Group, $F(2, 171) = .754$, $p = .472$, $\eta^2 = .009$, power = .177 or for Scenario, $F(2, 171) = .754$, $p = .472$, $\eta^2 = .009$, power = .177.

The interaction effects for Causality X Age Group, $F(2, 171) = .105$, $p = .901$, $\eta^2 = .001$, power = .066, and for Causality X Scenario, $F(2, 171) = 1.468$, $p = .233$, $\eta^2 = .017$, power = .310, were not significant. There was also no significant

interaction effect indicated for Age Group X Scenario, $F(4, 171) = 1.183$, $p = .320$, $\eta^2 = .027$, power = .366.

Causality X Scenario X Age Group did not show a significant effect, $F(4, 171) = .346$, $p = .846$, $\eta^2 = .008$, power = .127. Means for Success Q1 are listed in table 7.

Table 8: Means for Internal & External Causality, Success Q2

Internal Causality				
Scenario	18-34	35-55	56+	Total
Unspecified	67.50	77.25	90.75	78.50
Young Captain	75.25	75.75	74.50	75.17
Old Captain	73.75	82.00	85.75	80.50
Total	72.17	78.33	83.67	78.05
External Causality				
Unspecified	32.50	22.75	9.25	21.50
Young Captain	24.75	24.25	25.50	24.83
Old Captain	25.75	18.50	13.75	19.33
Total	27.67	21.83	16.17	21.89

The analysis of Q2 for success indicated a significant difference (utilizing the Greenhouse-Geisser statistic), $F(1, 171) = 371.645$, $p = .000$, $\eta^2 = .685$, power = 1.000, between Internal and External Causality. Overall participants placed more attribution of success on internal causality (78.05%) than on external causality (21.89%). There were no significant main effects for Age Group, $F(2, 171) = 1.333$, $p = .266$, $\eta^2 = .015$, power = .285 or for Scenario, $F(2, 171) = .333$, $p = .717$, $\eta^2 = .004$, power = .103.

There was an interaction effect for Causality X Age Group $F(2, 171) = 5.197$, $p = .006$, $\eta^2 = .057$, power = .824. As age increased so did the percentage attribution for internal causality. External causality shows an inverse trend. As age increased,

percentage attribution decreased. Pairwise comparisons using the Bonferonni correction revealed that the 18-34 years age group attributed significantly less success (Mean Difference = -11.5, $p = .005$) to internal causality than did the 56 and above years age group. The inverse was found for external causality. There was no significant difference within subjects for success for the 35–55 years age group.

There were no interaction effects indicated for Age Group X Scenario, $F(4, 171) = 1.333$, $p = .266$, $\eta^2 = .015$, power = .285 and for Causality X Age Group X Scenario, $F(4, 171) = 1.950$, $p = .104$, $\eta^2 = .044$, power = .579. Means for Success Q2 are listed in table 8.

Discussion

Results of the present study supported the hypothesis that pilot age is a factor in perceived competence of pilots. The overall perception scores of this study found that when old and young pilots perform equally, the young pilot will be assessed more strictly and therefore the perceived competence will be lower. This was contrary to the second hypothesis of this study as well as assessment of the literature concerning old age and negative stereotyping (Kastenbaum, 1994; Kwong See, et al., 2001; McTavish, 1971; Netz & Ben-Sra, 1993; Rosen & Jerdee, 1977; Tuckman & Lorge, 1952). Reasoning for this may be due to the type of job (piloting) being a highly skilled task that the general population knows very little about. This may have led participants to an opposite bias against the young (perceived as not having much experience) and facilitated a more positive attitude towards the old.

The third hypothesis that both older and younger participants will perceive the Old Pilot as less competent compared to the Unspecified Pilot was not supported for the same reasons as stated above. The scores were not significant for both Perceived Competence and Effectiveness variables, even though the Old Pilot scores for both 18-34 years age group and the 56 years and above age group were less than the Unspecified Pilot. However the 56 years and older age group showed significantly lower scores for the Young Pilot compared to the Unspecified Pilot for Perceived Effectiveness. This was also seen for the Perception of Competence variable where the 56 years and older age group showed a significantly less competent score for the Young Pilot as compared to both the Old Pilot and the Unspecified Pilot. This clearly indicates a negative bias towards young pilots on the part of the 56 years and older age group. None of the other

age groups showed a significant bias towards pilot age for Perceptions of Competence and Effectiveness.

The hypothesis that older participants would perceive the Old Pilot as being less competent to a smaller degree than younger participants was supported. Even though the results showed bias for the Young Pilot as apposed to the Old Pilot the results did support that the bias would not be as stringent when the pilots were rated by their corresponding age groups. In examining the impacts of pilot age on perceptions by participant age groupings (18-34, 35-55, 56<), it was revealed that an inverse relationship existed. As participant age increased, the Perceived Competence and Effectiveness scores increased for the Old Pilot and decreased for the Young Pilot. Hence the 56 years and above age group was not as strict in their assessment of the Old Pilot compared to the 18 – 34 years age group. A trend was also revealed in the assessment of Perceived Avoidance. The 18-34 years age group perceived the Old Pilot as having more ability to avoid the incident as compared to the Young Pilot and the 56 years and above age group perceived the Old Pilot as having less ability to avoid the incident as compared to the Young Pilot. The interaction effect for Avoidance however was marginal ($p = .057$) with the statistic having a power of .669. It is most likely that increasing the number of participants from 20 to 30 per condition would make this value significant.

The hypothesis that participants would attribute blame to external causality and attribute success to internal causality was supported by the data. This was expected since the scenario depicted a successful landing under adverse conditions. However there were no significant effects by participant age or scenario except for an effect for age in Success Q2. Older participants viewed the successful landing of the flight to be because of

internal characteristics (ability and effort) of the captain significantly more than younger participants. Younger participants viewed the successful landing to be caused by external characteristics (luck and task difficulty). This viewpoint may provide partial explanation for the negative view of the Young Pilot and the more positive view of the Old Pilot by the 56 years and older age group.

Any error in the photo rating task may be due to the fact that it was difficult getting male participants who would rate other males in physical attractiveness. In following studies, it may be advantageous to change the wording of “Physical Attractiveness” to “Physical Appearance”. Gender was not a point that was addressed within this study (other than for demographical purposes), but that leaves much potential for further study since gender has been shown to affect perceptions of competence (Lutsky, 1980; Hummert, 1994). There may be significant differences between male and female ratings of the scenarios. Also the age of the participant made a difference in how attractive older pictured individuals were perceived in the attractiveness category.

Conclusion

Both age of participant and the age of the pilot affect perceptions of competence. It appears that there is an age bias on the part of older individuals towards the young. A reverse relationship was indicated on the part of the young participants in that they viewed the Old Pilot more negatively than the Young Pilot; however in this study it was insignificant. Low power and effect size may have attributed to the insignificant statistical values. It would be interesting to perform this same study for a common task and a skilled task such as a common driver and race car driver and see if the proposed hypothesis rings true.

Research in aging is becoming even more important as the social and performance impact on society becomes more intense due to the increase of older individuals in the workforce and the rising average age of the U.S. citizen. It is essential to examine age differences pertaining to biological, cognitive and social constructs and how these factors relate to perceptions and beliefs of competence in the workplace held by the populous.

References

- Age Discrimination in Employment Act of 1967*, Pub. L. No. 90-202, 81 Stat. 602
(codified as amended 29 U. S. C. A. 621-634).
- Age Discrimination in Employment Act of 1978*, Pub. L. No. 95-256, 92 Stat. 189
(codified as amended 29 U. S. C. A. 623-634).
- Age Discrimination in Employment Act of 1986*, Pub. L. No. 99-592, 100 Stat. 3342
(codified as amended 29 U. S. C. A. 622-624, 630-631).
- Allee, John G. (Ed.). (1986). *Webster's dictionary*. Baltimore, MD: Ottenheimer Publishers, Inc.
- American Heritage Dictionary of the English Language*, 4th ed. (2000). Boston, MA. Houghton Mifflin Company.
- Besco, R. O., Sangal S. P., Nethus T. E. & Veronneau S. J. H. (1997). *Designing for an aging population: ten years of human factors and ergonomic research*. Santa Monica, CA. Human Factors & Ergonomics Society.
- Bieman-Copland, Sherie & Ryan, Ellen Bouchard (2001). Social perceptions of failures in memory monitoring. *Psychology and Aging*, Vol. 16, No. 2, pp. 357-361.
- Billings, C. E. (1991). *Human-centered aircraft automation: A concept and guidelines*. (NASA Tech. Memor. 103885). Moffet Field, CA: NASA Ames Research Center.
- Blair, Cornelia (2000). *Growing old in america*. Wylie, TX: Information Plus.
- Cowgill, D. O. (1974). Aging and modernization: A revision of the theory. In J. F. Gubrium (Ed.), *Late life; communities and environmental policy* (pp. 123-146). Springfield, IL: Charles C. Thomas.

- Craik, Fergus I. M. & Jennings, Janine M. (1992). Human memory. In Fergus I. M. Craik and Timothy A. Salthouse (Eds). *Handbook of Aging and Cognition* (pp. 51-110). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.
- Cumming, E. & Henry, W. E. (1961). *Growing old: The process of disengagement*. New York, N.Y.: Basic Books.
- Czaja, Sara J. (Ed.). (1990). *Human factors research needs for an aging population*. Washington, D. C.: National Academy Press.
- Dowd, J. J. (1975). Aging as exchange: A preface to theory. *Journal of Gerontology*, 30, pp. 584-594.
- Dukes, R., Johnson, R., Newton, H., and Overstreet, S. (1991). Stereotypes of pilots and apprehension about flying with them: A study of commercial aviation scenarios. *Aviation, Space, and Environmental Medicine*, 62, 722-726.
- Kline, D. & Scialfa, C. (1997). Sensory and perceptual functioning: Basic research and human factors implications. In Arthur D. Fisk & Wendy A. Rogers (Eds). *Handbook of human factors and the older adult* (pp. 27-54). San Diego, CA: Academic Press, Inc.
- Kogan, N. (1961). Attitudes toward old people: The development of a scale and an examination of correlates. *Journal of Abnormal and Social Psychology*, 62, 44-54.
- Kwong See, Sheree T., Wood, Tammy L. & Hoffman, Hunter G. (2001). Perceptions of an old female eyewitness: Is the older eyewitness believable? *Psychology and Aging*, Vol. 16, No. 2, pp. 346-350.

- Holtzman, Joseph M. & Akiyama, Hiroko (1985). What children see: The aged on television in japan and the united states. *The Gerontologist*, (pp. 62-68) Vol. 25, No. 1
- Horn, J. L. & Cattell, R. B. (1966). Age differences in primary mental ability factors. *Journal of Gerontology*, 21, 210-220.
- Hultsch, D. F. & Dixon, R. A. (1990). Learning and memory. In Arthur D. Fisk & Wendy A. Rogers (Eds.), *Handbook of psychology and aging* (pp. 258-274). San Diego, CA: Academic Press, Inc.
- Hummert, Mary Lee (1994). Physiognomic cues to age and the activation of stereotypes of the elderly in interaction. *International Journal of Aging and Human Development*, Vol. 39 (1) pp. 5-19.
- Hyland, D. T., Kay, E. J., Deimler, J. D. & Gruman, E. B. (1994). *Age 60 study, part 2: airline pilot age and performance – A review of the scientific literature*. U. S. Department of Transportation, Federal Aviation Administration (Report No. DOT/FAAAM-94/21).
- Hyland, D. T., Kay, E. J. & Deimler, J. D. (1994). *Age 60 study, part 4: Experimental evaluation of pilot performance*. U. S. Department of Transportation, Federal Aviation Administration (Report No. DOT/FAAAM-94/23).
- Kay, E. J., Hillman, D. T., Hyland, D. T., Voros, R. S., Harris, R. M. & Deimler, J. D. (1994). *Age 60 study, part 3: Consolidated database experiments final report*. U. S. Department of Transportation, Federal Aviation Administration (Report No. DOT/FAAAM-94/21).

- Kuypers, J. S., & Bengtson, V. L. (1973). Social breakdown and competence: A model of normal aging. *Human Development*, 16, pp. 181-201.
- Lassiter, D. L., Morrow, D. G., Hinson, G. E., Miller, M. & Hambrick, D. Z. (1997). Expertise and age effects on pilot mental workload in a simulated aviation task. In *Designing for an aging population: ten years of human factors and ergonomic research*. Santa Monica, CA. Human Factors & Ergonomics Society.
- Lemon, B. W., Bengtson, V. L., & Peterson, J. A. (1972). An exploration of the activity theory of aging: Activity types and life satisfaction among in-movers to a retirement community. *Journal of Gerontology*, 27, pp. 511-523.
- Levine, M. L. (1988). *Age discrimination and the mandatory retirement controversy*. Baltimore, MD: The Johns Hopkins University Press.
- Louis Harris and Associates, Inc. (1976). *The myth and reality of aging in america*. Washington, D.C.: National Council on the Aging, Inc.
- Lutsky, Neil S. (1980). Attitudes toward old age and elderly persons. *Annual Review of Gerontology & Geriatrics*, Vol. 1, Ch. 13, pp. 287-336. New York, NY: Springer Publishing Company.
- McDowd J. M. & Birren, J. E. (1990). Aging and attention processing. In J. E. Birren & K. W. Schaie (Eds.), *Handbook of the psychology of aging* (3rd ed., pp. 222-233). San Diego, CA: Academic Press, Inc.
- Merriam-Webster's Collegiate Dictionary* (1994), 10th ed. Springfield, MA: Merriam-Webster, Inc.
- Morrow, D. G., Menard, W. E. & Stine-Morrow E. A. L. (1999). The influence of aging and expertise on pilot communication. In *Proceedings of the Tenth International*

- Symposium on Aviation Psychology* (pp. 1337-1342). Columbus, OH: OSU and Association of Aviation Psychologists.
- Morrow, D. & Leirer, V. (1997). Aging, pilot performance, and expertise. In Arthur D. Fisk & Wendy A. Rogers (Eds). *Handbook of human factors and the older adult* (pp. 199-230). San Diego, CA: Academic Press, Inc.
- Palmore, Erdman B. (1990). *Ageism negative and positive*. New York, NY: Springer Publishing Company, Inc.
- Panek, Paul E. (1997). The older worker. In Arthur D. Fisk & Wendy A. Rogers (Eds), *Handbook of human factors and the older adult* (pp. 363-394). San Diego, CA: Academic Press, Inc.
- Park, D. C. (1992). Applied cognitive aging research. In Fergus I. M. Craik & Timothy A. Salthouse (Eds.), *The handbook of aging and cognition* (pp. 449-493). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.
- Passuth, Patricia M. & Cook, Fay Lomax (1985). Effects of television viewing on knowledge and attitudes about older adults: A critical reexamination. *The Gerontologist*, (pp. 69-77) Vol. 25, No. 1.
- Passuth, Patricia M. & Bengtson, Vern L. (1988). Sociological theories of aging: Current perspectives and future directions. In James E. Birren & Vern L. Bengtson (Eds.) *Emergent Theories of Aging*, (pp.333-355). New York, NY: Springer Publishing Company, Inc.
- Paulsen, Marianne (2002). *Perception of competence in male and female pilots: Between group differences*. Unpublished thesis for Masters in Human Factors & Systems at Embry-Riddle Aeronautical University.

- Perlmutter, M. (1988). Cognitive potential throughout life. In James E. Birren & Vern L. Bengtson (Eds.), *Emergent Theories of Aging* (pp. 247-268). New York, NY: Springer Publishing Company.
- Posner, Richard A. (1995). *Aging and old age*. Chicago, IL: The University of Chicago Press.
- Quadagno, J. S (1982). *Aging in early industrial society: work, family, and social policy in nineteenth-century england*. New York, NY: Academic Press.
- Restak, R. M. (1997). *Older and wiser*. New York, NY: Simon & Schuster.
- Riley, M. W., Johnson M., & Foner, A. (1972). *Aging and society: A sociology of age stratification*, Vol. 3. New York, NY: Russell Sage Foundation.
- Robbins, Stephen P. (2001). *Organizational behavior*, 9th Ed. Upper Saddle River, NJ: Prentice Hall.
- Rose, A. M., (1964). A current theoretical issue in social gerontology. *The Gerontologist*, 4, pp. 46-50.
- Rosen, Benson & Jerdee, Thomas H. (1977). Too old or not too old. *Harvard Business Review*, Nov.-Dec., pp. 97-106.
- Salthouse, T. A. (1990). Cognitive competence and expertise in aging. In James E. Birren & K. Warner Schaie (Eds.) *Handbook of the psychology of aging* (3rd ed., pp. 310-319). San Diego, CA: Academic Press, Inc.
- Sekuler, R. & Blake, R. (1994). *Perception* (3rd ed.). New York, NY: McGraw-Hill, Inc.
- Schaie, K. Warner (1996). Intellectual development in adulthood. In James E. Birren & K. Warner Schaie (Eds.), *Handbook Of The Psychology Of Aging*, (5th ed., pp. 266-286). San Diego, CA: Academic Press, Inc.

- Shock, N. W. (1985). Longitudinal studies of aging in humans. In C. E. Finch & E. L. Schneider (Eds.), *Handbook of the biology of aging* (pp. 721-743). New York, NY: Van Nostrand Reinhold.
- Solso, R. L. (1998). *Cognitive psychology* (5th ed.). Boston, MA: Allyn & Bacon.
- Sparrow P. R. & Davies D. R. (1988). Effects of age, training, and job complexity on technical performance. *Psychology & Aging* 3, 307-314.
- Spirduso, W. W. & MacRae, P. G. (1990). Motor performance and aging. In James E. Birren & K. Warner Schaie (Eds.) *Handbook of the psychology of aging* (3rd ed., pp. 183-200). San Diego, CA: Academic Press, Inc.
- Staudinger, U. M. & Paupathi, M. (2000). *The handbook of aging and cognition* (2nd ed., pp. 633-688). Fergus I. M. Craik & Timothy A. Salthouse (Eds.). Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.
- Sternberg, S. (1969). On the discover of processing stages: Some extensions of Donders's method. *Acta Psychologica*, 30, pp. 276-315.
- Tsang, P. S. (1992). A reappraisal of aging and pilot performance. *The International Journal of Aviation Psychology*, 2(3) (pp. 193-212).
- Tsang, P. S. (1995). Boundaries of cognitive performance as a function of age and piloting experience. *In Proceedings of the Eighth International Symposium on Aviation Psychology* (pp. 903-907). Columbus, OH: OSU and Association of Aviation Psychologists.
- Tsang, P. S. (1997). Age, flight experience, time-sharing performance, and perceived workload. *In Proceedings of the Ninth International Symposium on Aviation*

- Psychology* (pp. 42-46). Columbus, OH: OSU and Association of Aviation Psychologists.
- Tsang, P. S. & Shaner, T. L. (1998). Age, attention, expertise, and time-sharing performance. *Psychology and Aging*, 13, pp. 323-347.
- Tuckman, J. & Lorge, I. (1952). Attitudes toward older workers. *Journal of applied psychology*. Vol. 36, No. 3, pp. 149-153.
- United States General Accounting Office. (1989). *Aviation safety: Information on FAA's age 60 rule for pilots: Fact sheet for the chairman, select committee on aging, house of representative/U. S. general accounting office*. Washington D.C: Author.
- U.S. Census Bureau. (1994). *How we're changing, Demographic state of the nation: 1995* (P23-188) Current population reports: special studies).
- U.S. Census Bureau. (1996). *65+ in the united states* (P23-190 Current population reports: special studies).
- Vincenzi, D. A., Mouloua, M., Muldoon, B., Hardy, D. J. & Parasuraman, R. (1997). Aging and workload on monitoring of automation failures in flight simulated tasks. *In Proceedings of the Ninth International Symposium on Aviation Psychology* (pp. 1556-1561). Columbus, OH: OSU and Association of Aviation Psychologists.
- Waldmand, D. & Avolio, B. (1986). A meta analysis of age differences in job performance. *Journal Of Applied Psychology* 71: 33-38, 37.
- Willis, S. L. & Schaie, K. W. (1986). Training the elderly on the ability factors of spatial orientation and inductive reasoning. *Psychology & Aging*, 1, 239-247.

Appendix A

Answer Sheet, Part I

On the back of each photo is a number. This number corresponds to the questions numbered on this answer sheet. Please rate the following photos by writing in the space provided the perceived age of the individual or in the case of the scaled questions, write a number from 1 (Not Attractive) to 10 (Very Attractive) in the space provided. Please indicate only one answer per photo.

What is the apparent age of the individual in the photo?

- | | | | | |
|-----------|-----------|-----------|-----------|-----------|
| 1. _____ | 12. _____ | 23. _____ | 34. _____ | 45. _____ |
| 2. _____ | 13. _____ | 24. _____ | 35. _____ | 46. _____ |
| 3. _____ | 14. _____ | 25. _____ | 36. _____ | 47. _____ |
| 4. _____ | 15. _____ | 26. _____ | 37. _____ | 48. _____ |
| 5. _____ | 16. _____ | 27. _____ | 38. _____ | 49. _____ |
| 6. _____ | 17. _____ | 28. _____ | 39. _____ | 50. _____ |
| 7. _____ | 18. _____ | 29. _____ | 40. _____ | 51. _____ |
| 8. _____ | 19. _____ | 30. _____ | 41. _____ | 52. _____ |
| 9. _____ | 20. _____ | 31. _____ | 42. _____ | 53. _____ |
| 10. _____ | 21. _____ | 32. _____ | 43. _____ | 54. _____ |
| 11. _____ | 22. _____ | 33. _____ | 44. _____ | 55. _____ |

Please rate the physical attractiveness of the individual in the photo.

Not Attractive					Very Attractive				
1	2	3	4	5	6	7	8	9	10
1. _____	12. _____		23. _____	34. _____		45. _____			
2. _____	13. _____		24. _____	35. _____		46. _____			
3. _____	14. _____		25. _____	36. _____		47. _____			
4. _____	15. _____		26. _____	37. _____		48. _____			
5. _____	16. _____		27. _____	38. _____		49. _____			
6. _____	17. _____		28. _____	39. _____		50. _____			
7. _____	18. _____		29. _____	40. _____		51. _____			
8. _____	19. _____		30. _____	41. _____		52. _____			
9. _____	20. _____		31. _____	42. _____		53. _____			
10. _____	21. _____		32. _____	43. _____		54. _____			
11. _____	22. _____		33. _____	44. _____		55. _____			

Please provide the following information.

Age _____

Sex _____

Nationality _____

Appendix B

Informed Consent Part I & II

Study Conducted by Laura M. Stelmach
Chair: Dr. Dennis Vincenzi
Embry-Riddle Aeronautical University
Human Factors and Systems
Daytona Beach, FL. 32114

The experiment is designed to investigate the relationship between personal characteristics and the perception of competence. There are two parts to this experiment. Part I in which you are participating in consists of a single, 20-minute session. You will be asked to rate apparent age and physical attractiveness of 55 photos of individuals taken from the Internet and magazines. You will also be asked to provide some general demographic information. Please do not communicate with other participants or read another participants materials while the study is being conducted.

There are no known risks associated with this experiment. Please be assured that any information that you provide will be held in strict confidence by the researcher and at no time will your name be reported along with your responses. Please understand that your participation in this research is voluntary and you may withdraw at any time.

At your request, you will receive a report of the results upon completion of the study. Thank you for your participation. If you have any question, please ask during the experiment or feel free to call me at (407) 474-6401.

Statement of Consent

I acknowledge that I have been informed of the general purpose of this study. I acknowledge that my participation in this study is entirely voluntary and that I am free to withdraw at any time.

Signature of Participant: _____

Date: _____

I would like to receive a report of results from this experiment: yes ____ no ____

If you would like to receive a report of the results from this experiment please give an e-mail address or other address where the report can be sent.

Study Conducted by Laura M. Stelmach
Chair: Dr. Dennis Vincenzi
Embry-Riddle Aeronautical University
Human Factors and Systems
Daytona Beach, FL. 32114

The experiment you are about to participate in is designed to investigate the relationship between personal characteristics and the perception of competence. The experiment consists of a single, 15-minute session. You will be asked to read a flight scenario and then answer a questionnaire pertaining to that scenario. You will also be asked to provide some general demographic information. Please do not communicate with other participants or read another participants materials while the study is being conducted.

There are no known risks associated with this experiment. Please be assured that any information that you provide will be held in strict confidence by the researcher and at no time will your name be reported along with your responses. Please understand that your participation in this research is voluntary and you may withdraw at any time.

At your request, you will receive a report of the results upon completion of the study. Thank you for your participation. If you have any question, please ask during the experiment or feel free to call me at (407) 474-6401.

Statement of Consent

I acknowledge that I have been informed of the general purpose of this study. I acknowledge that my participation in this study is entirely voluntary and that I am free to withdraw at any time.

Signature of Participant: _____ Date: _____

I would like to receive a report of results from this experiment: yes ____ no ____

If you would like to receive a report of the results from this experiment please give an e-mail address or other address where the report can be sent.

Appendix C

Instructions Part I & II

Instructions

My name is Laura M. Stelmach and I am a Human Factors graduate student conducting my thesis. Before we begin, I would like to thank you for your time and participation. I will be passing out packets to each of you to be opened upon completion of my instructions. Once you have received your packet, please do not verbally communicate with others or read each other's information for the duration of the experiment.

Please open your packet and read and sign the consent form before beginning. When that has been completed please take out the batch of photos and notice that they are numbered on the backside 1 thru 55. This number will correspond to the numbers on the answer sheet. Please answer the questions posed to you, including the requested demographic information. Be sure to indicate only one answer per question. Your answers will be kept completely confidential.

When you have finished, please place all materials back into the packet and close it. I will then provide you with an additional form to be read and signed. If you have any questions during the experiment feel free to get my attention and I will attempt to provide clarification. Please begin.

Instructions

My name is Laura M. Stelmach and I am a Human Factors graduate student conducting my thesis. Before we begin, I would like to thank you for your time and participation. I will be passing out packets to each of you to be opened upon completion of my instructions. Once you have received your packet, please do not verbally communicate with others or read each other's information for the duration of the experiment.

Please open your packets. Please read and sign the consent form before beginning. When that has been completed read the provided scenario and answer the questions posed to you, including the requested demographic information. For the questions utilizing a scale, indicate only one answer per question along the continuum of the scale. For the questions requesting percentage responses, assign percentages for each category in any multiple of 10 between 0 and 100, with the total of all categories equaling 100 for each question. Your answers will be kept completely confidential.

When you have finished, please place all materials back into the packet and close it. I will then provide you with an additional form to be read and signed. If you have any questions during the experiment feel free to get my attention and I will attempt to provide clarification. Please begin.

Appendix D

Debriefing Form Part I & II

Study Conducted by Laura M. Stelmach
Chair: Dr. Dennis Vincenzi
Embry-Riddle Aeronautical University
Human Factors and Systems
Daytona Beach, FL. 32114

This experiment is designed to investigate the relationship between personal characteristics and the perception of competence. Part I of the study that you just participated in is concerned with the perception of age and physical attractiveness for the selection of a photo to go with the scenarios used in Part II of this study. If you wish to participate in Part II please let the examiner know and write down contact information. Such information is strictly confidential and will only be used to contact you to schedule an appointment for participation in Part II of the study.

Do you wish to participate in Part II of this study?

Yes_____ No_____

Contact Information: _____

Signature of Participant: _____

Date: _____

Study Conducted by Laura M. Stelmach
Chair: Dr. Dennis Vincenzi
Embry-Riddle Aeronautical University
Human Factors and Systems
Daytona Beach, FL. 32114

Part II of the study that you have just participated in is concerned with the effects of age on the perception of pilot competence. Three different scenarios that varied by the age of the Captain in the scenario were utilized. Participants either received a scenario in which the Captain was identified as retired, young or unspecified. This was the only area of variance between the scenarios and all questionnaires were identical. The researcher is seeking evidence of the presence of an age bias within the traveling public by observing age differences in competency ratings when assessed through dimensions related to pilot behavior. Your responses will enable the researcher to evaluate your perceptions of the Captain in the scenario in the areas of competence, effectiveness, blame, avoidability, and attribution.

Findings are expected to be evidence for the continued presence of age bias in rating the competence of individuals within the aviation community. If it becomes recognized that members of a social category are commonly disadvantaged, in settings such as aviation that involve evaluation with a stricter ability standard, the situation must be rectified. Research in this area is needed in order to understand how young and old pilots are perceived and to provide a basis for continued research in this area that will provide insight to the challenges faced by aging aviators.

Signature of Participant: _____

Date: _____

Appendix E

Scenarios

Older Captain Scenario

Captain Winfield is a 767 Captain for a major commercial airline. Captain Winfield has logged 6,000 total flight hours in this type of aircraft and this was the Captains last flight, just before retiring at age 60. As flight 1027 approached La Guardia International Airport, after a turbulent flight from Los Angeles, Captain Winfield made an announcement. The Captain told passengers that the current conditions in New York were cold and rainy with the winds out of the east at 25 mph, gusting to 40 mph. Additionally, the Captain apologized for not being able to make up more than 30 minutes of the 2-hour delay of their flight. As the Boeing 767 was on final approach, the passengers could feel turbulence and abrupt adjustments being made to try and stabilize the approach. Subsequently the aircraft made a hard landing a ways down the runway. As the aircraft continued down the runway, it began to hydroplane and slide. The Captain brought the aircraft to an abrupt stop just before reaching the end of the runway, successfully avoiding collision with other aircraft. There were no fatalities or serious injuries. Of the 334 passengers, 25 incurred minor injuries such as abrasions and bruising.

Bearing in mind Captain Winfield's last flight before retiring, please answer the following questions.

Younger Captain Scenario

Captain Winfield is a 767 Captain for a major commercial airline. Captain Winfield is also one of the youngest Captains in the fleet, having logged 6,000 total flight hours in this type of aircraft. As flight 1027 approached La Guardia International Airport, after a turbulent flight from Los Angeles, Captain Winfield made an announcement. The Captain told passengers that the current conditions in New York were cold and rainy with the winds out of the east at 25 mph, gusting to 40 mph. Additionally, the Captain apologized for not being able to make up more than 30 minutes of the 2-hour delay of their flight. As the Boeing 767 was on final approach, the passengers could feel turbulence and abrupt adjustments being made to try and stabilize the approach. Subsequently the aircraft made a hard landing a ways down the runway. As the aircraft continued down the runway, it began to hydroplane and slide. The Captain brought the aircraft to an abrupt stop just before reaching the end of the runway, successfully avoiding collision with other aircraft. There were no fatalities or serious injuries. Of the 334 passengers, 25 incurred minor injuries such as abrasions and bruising.

Bearing in mind young Captain Winfield's flight scenario, please answer the following questions.

Unspecified Scenario

Captain Winfield is a 767 Captain for a major commercial airline and has logged 6,000 total flight hours in this type of aircraft. As flight 1027 approached La Guardia International Airport, after a turbulent flight from Los Angeles, Captain Winfield made an announcement. The Captain told passengers that the current conditions in New York were cold and rainy with the winds out of the east at 25 mph, gusting to 40 mph. Additionally, the Captain apologized for not being able to make up more than 30 minutes of the 2-hour delay of their flight. As the Boeing 767 was on final approach, the passengers could feel turbulence and abrupt adjustments being made to try and stabilize the approach. Subsequently the aircraft made a hard landing a ways down the runway. As the aircraft continued down the runway, it began to hydroplane and slide. The Captain brought the aircraft to an abrupt stop just before reaching the end of the runway, successfully avoiding collision with other aircraft. There were no fatalities or serious injuries. Of the 334 passengers, 25 incurred minor injuries such as abrasions and bruising.

Bearing in mind Captain Winfield's flight scenario, please answer the following questions.

Appendix F

Questionnaire, Part II

Please answer the following questions by indicating only one answer on the scale for each question. Answer the questions within the context of the following definitions.

Effectiveness is defined as producing the desired outcome.

Competence is defined as possessing ability.

Avoidance is defined as evading or keeping clear of.

1. To what extent was the role of the Captain effectively performed in the scenario?

Low							High
1	2	3	4	5	6	7	

2. To what extent was the role of Captain competently performed in the scenario?

Low							High
1	2	3	4	5	6	7	

3. To what extent could the Captain have avoided the incident in the scenario?

Low							High
1	2	3	4	5	6	7	

Please answer the remainder of the questions by assigning a percentage for each category.

Percentages may be any multiple of 10 between 0 and 100. Total of all categories within each question must equal 100.

Blame is defined as being held responsible.

4. What percentages of blame for the incident encountered in the scenario should be assigned to the following categories?

_____ Captain	_____ Delay Time	_____ Airport
_____ Weather	_____ Aircraft	

5. How much of a role did the following play in the successful landing of the flight?

_____ Captain	_____ Delay Time	_____ Airport
_____ Weather	_____ Aircraft	

6. What percentages do you assign to the following categories in contributing to the success of the Captain in the scenario?

_____ Effort	_____ Luck
_____ Ability	_____ Task Difficulty

7. What percentages do you assign to the following categories in contributing to the Captain encountering the adverse conditions in the scenario?

_____ Effort _____ Luck
 _____ Ability _____ Task Difficulty

8. If you were booked on a continuation of the flight to your final destination with the same captain and crew, how would you feel about continuing on?

No apprehension at all Much apprehension

1 2 3 4 5 6 7

Please provide the following information.

Age _____

Sex _____

Nationality _____

Are you a certified pilot? _____ Yes _____ No

How many commercial **domestic** flights have you been on in the past year? _____

How many commercial **international** flights have you been on in the past year? _____

Do you consider yourself an experienced air traveler? _____ Yes _____ No

How would you rate your experience level as an air traveler?

Low High

1 2 3 4 5 6 7

Using the scale below, please indicate how you feel about the following statements.

- A. STRONGLY DISAGREE
- B. DISAGREE
- C. SLIGHTLY DISAGREE
- D. SLIGHTLY AGREE
- E. AGREE
- F. STRONGLY AGREE

- ___ 1. It would probably be better if most old people lived in residential units with people of their own age.
- ___ 2. Most old people are constantly complaining about the behavior of the younger generation.
- ___ 3. It is evident that most old people are very different from one another.
- ___ 4. Old people have too much power in business and politics.
- ___ 5. Most old people get set in their ways and are unable to change.
- ___ 6. When you think about it, old people have the same faults as anybody else.
- ___ 7. There are a few exceptions, but in general most old people are pretty much alike.
- ___ 8. Most old people need no more love and reassurance than anyone else.
- ___ 9. Most old people should be more concerned with their personal appearance; they're too untidy.
- ___ 10. People grow wiser with the coming of old age.
- ___ 11. Most old people are really no different from anybody else; they're as easy to understand as younger people.
- ___ 12. If old people expect to be liked, their first step is to try to get rid of their irritating faults.
- ___ 13. You can count on finding a nice residential neighborhood when there is a sizeable number of old people living in it.

Using the scale below, please indicate how you feel about the following statements.

- A. STRONGLY DISAGREE
- B. DISAGREE
- C. SLIGHTLY DISAGREE
- D. SLIGHTLY AGREE
- E. AGREE
- F. STRONGLY AGREE

- ____ 14. One of the most interesting and entertaining qualities of most old people is their accounts of their past experiences.
- ____ 15. Most old people can generally be counted on to maintain a clean, attractive home.
- ____ 16. Most old people would prefer to continue working just as long as they possibly can rather than be dependent on anybody.
- ____ 17. In order to maintain a nice residential neighborhood, it would be best if too many old people did not live in it.
- ____ 18. Most old people are cheerful, agreeable and good humored.
- ____ 19. It would probably be better if most old people lived in residential units that also housed younger people.
- ____ 20. Most old people would prefer to quit work as soon as pensions or their children can support them.
- ____ 21. Most old people make one feel ill at ease.
- ____ 22. Most old people spend too much time prying into the affairs of others and giving unsought advice.
- ____ 23. There is something different about most old people; it's hard to figure out what makes them tick.

Using the scale below, please indicate how you feel about the following statements.

- A. STRONGLY DISAGREE
- B. DISAGREE
- C. SLIGHTLY DISAGREE
- D. SLIGHTLY AGREE
- E. AGREE
- F. STRONGLY AGREE

- _____ 24. Most old people make excessive demands for love and reassurance.
- _____ 25. Most old people tend to keep to themselves and give advice only when asked.
- _____ 26. Old people should have more power in business and politics.
- _____ 27. Most old people are very relaxing to be with.
- _____ 28. It is foolish to claim that wisdom comes with old age.
- _____ 29. Most old people are capable of new adjustments when the situation demands it.
- _____ 30. Most old people seem to be quite clean and neat in their personal appearance.
- _____ 31. Most old people are irritable, grouchy and unpleasant.
- _____ 32. One seldom hears old people complaining about the behavior of the younger generation.
- _____ 33. Most old people tend to let their homes become shabby and unattractive.
- _____ 34. Most old people bore others by their insistence on talking about the "good old days."